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ENUMERANTUR PLANTAE DAKOTAE SEPTENTRIONALIS VASCULARES.—III.

ENUMERAVIT J. LUNELL.

The Vascular Plants of North Dakota.—III.

With Notes by J. Lunell.

Family 14. **CYPERACEAE** J. St. Hilaire Expos. Fam. I: 62. (1805).

CYPERUS Hom. Odyss. XXI: 391. Hippoc. vie acut. 409. Theophr. Hort. IV: 11., also *Schoenus* of same. Diosc. I: 4, Theoc. loc. comm. *Zerna* Pseud. Democ. in Geopon XII: 6. *Juncus Cyperus dictus* Plinius XXI: 79 = *Cyperus rotundus* Linn. and almost all other writers. *Cyperus* Linn. Sp. Pl. 44. (1753).

189. *Cyperus Schweinitzii* Torr. Ann. Lye. N. Y. 3: 276 (1836)
Pleasant Lake; Denbigh (Bergman).

190. *Cyperus acuminatus* Torr. et Hook. Ann. Lye. N. Y. 3: 435. (1836).

Leeds (extinct); Fargo (O. A. Stevens).

191. *Cyperus erythrorhizos* Muhl. Gram. 20. (1817).
Jamestown.

ELEOCHARIS R. Br. Prod. Fl. Nov. Holl. I: 224. (1810).

192. *Eleocharis quadrangulata* (Michx.) R. et S. Syst. 2: 155. (1817).

Scirpus quadrangulatus Michx. Fl. Bor. Am. I: 30. (1803).

Eleocharis mutata Britton, not R. et S.

Benson Co., acc. to specimen deposited in the Gray Herbarium by the writer in 1906.

193. *Eleocharis olivacea* Torr. Ann. Lye. N. Y. 3: 300. (1836)?

Benson Co., acc. to specimen deposited in the Gray Herbarium by the writer in 1906.

194. *Eleocharis ovata* (Roth.) R. et S. Syst. 2: 152. (1817).
Scirpus ovatus Roth. Catal. Bot. I: 5. (1797).
Eleocharis monticola leviseta Fernald.
Leeds, Butte.
195. *Eleocharis palustris* (Linn.) R. et S. Syst. 2: 151 (1817).
Scirpus palustris Linn. Sp. Pl. 47. (1753).
Leeds, Butte.
196. *Eleocharis palustris* var. *vigens* Bailey; Britton, Journ. N. Y. Micros. Soc. 5: 104. (1889).
Leeds, Oberon.
197. *Eleocharis glaucescens* Willd. Enum. 76. (1809).
Leeds, Butte.
198. *Eleocharis acicularis* (Linn.) R. et S. Syst. 2: 154. (1817).
Scirpus acicularis Linn. Sp. Pl. 48. (1753).
Leeds, Pleasant Lake.
199. *Eleocharis Wolfii* A. Gray, Britton Journ. N. Y. Micros. Soc. 5: 105. (1889).
Scirpus Wolfii A. Gray, Proc. Am. Acad. 10: 77. (1874).
Fargo (O. A. Stevens).
200. *Eleocharis acuminata* (Muhl.) Nees. Linnaea 9: 294. (1835).
Scirpus acuminatus Muhl. Gram. 27. (1817).
Eleocharis compressa Sulliv. Am. Journ. Sci. 42: 50. (1842).
Leeds, Pleasant Lake.
- SCIRPUS* Tragus, Stirp. Com. p. 684. (1552).
Scirpus Tour. Élem. Bor. 420. (1694).
Scirpus Linn. Sp. Pl. 47. (1753).
201. *Scirpus subterminalis* Torr. Fl. U. S. I: 47. (1824).
Benson Co., acc. to specimen deposited in the Gray Herbarium by the writer in 1906.
202. *Scirpus americanus* Pers. Syn. I: 68. (1805).
Scirpus pungens Vahl. Enum. 2: 255. (1806).
Leeds.
203. *Scirpus americanus longispicatus* Britton, Trans. N. Y. Acad. Sci. II: 78. (1892).
Shores of Devils Lake.
204. *Scirpus solispicatus* Lunell, sp. nov.
Spicula assidue solitaria, parva. Alioqui *S. americano* consimilis.
Spikelet constantly solitary, small. Otherwise as *S. americanus*.
Butte.

205. *Scirpus validus* Vahl. Enum. 2: 268. (1806).
Leeds, Turtle Mountains.
206. *Scirpus occidentalis* (Wats.) Chase, Rhodora, vol. 6,
p. 68. (1904).
Leeds.
207. *Scirpus brittonianus* Piper. Contr. U. S. Nat. Herb. 11:
157. (1906).
Scirpus campestris
Butte, Dunsieith.
208. *Scirpus fluviatilis* (Torr.) A. Gray. Man. 527. (1848).
Scirpus maritimus var. *fluviatilis* Torr. Ann. Lyc. N. Y. 3:
324. (1836). Leeds.
209. *Scirpus rubrotinctus* Fernald, Rhodora (1900). 20.
Pleasant Lake.
210. *Scirpus atrovirens* Muhl. Gram. 43. (1817).
Butte, Dunsieith.
- ERIOPHORUM* Linn. Syst. (1735), Gen. 22. (1737), Sp. Pl.
52. (1753).
Linagrostis Tour. I. R. H. App. 664 (1708), also *Linagrostis*
Tabernaemont. Hort. 559. (1613). *Plumaria* Heister. Syst. 12.
(1748)! Gramen *Eriophorum* Dodonaeus. Tabernaemontanus'
name is the oldest, but Bubani does not like it, because of deri-
vation, and the writer takes the stand with him.
211. *Eriophorum angustifolium maius* Schultz.
Butte, Towner.
- RYNCHOSPORA* Vahl. Enum. 2: 229. (1806).
Holoschoenus Theophr. appears to be *Schoenus Mariscus*
Linn. and of the Greeks = *Juncus acutus*. *Schoenus leia* Diosc. =
Scirpus Holoschoenus L. *Schoenus Enosmus* Diosc. = *Andropogon*
schoenanthus. *Schoenus* of greeks is therefore rather undefinable
and may be held as equivalent of *Juncus effusus* L. or *Scirpus*
lacustris L.
212. *Rynchospora capillacea* Torr. Comp. 41. (1826); A.
Gray, Ann. Lyc. N. Y. III: 214. (1835), Man. 533; Britt. Ill.
Fl. I: 278.
Schoenus setaceus Muhl. Gram. 6. (1817).
Butte.
- CAREX* Virgilius Georg. III. 231. Linn. Sp. Pl. 972. (1753).
Xiphion of greeks (?). *Thryon* Homer. Il. 381 (?). *Carectum*
Vitruvius.

ANALYTICAL KEY.*

- Achenes lenticular; stigmas two.
 Lateral spikes short, sessile; staminate flowers at base or apex of spikes, or plants at times with heads dioecious or nearly so.
 Rootstocks long, creeping, the culms 1—few together.....I
 Culm caespitose, the rootstocks at most short creeping
 Staminate flowers at top of spikes.....II
 Staminate flowers at bottom of spikes.....III
 Lateral spikes elongated, slender, peduncled, the terminal normally staminate.....IV
 Achenes triangular; stigmas three
 Perigynia pubescent.....V
 Perigynia glabrous or tuberculate-hispid.....VI

I.

- Spikes 10 or less, distinct; sheaths hyaline opposite blades.
 Heads not dioecious; styles short; perigynia short-beaked.
 Leaf blades narrowly involute; rootstocks very slender, light brown.....1. *C. stenophylla*
 Leaf blades 1.5–4 mm. wide, flat above; rootstocks stout, brownish black.....2. *C. camporum*
 Heads dioecious; styles long; perigynia long-beaked.....3. *C. Douglasii*
 Spikes very numerous, the upper closely aggregated; sheaths green striate opposite blades.....4. *C. Sartwellii*

II.

- Spikes not very numerous, in a simple head.
 Perigynia deep green at maturity, the spikes all separate..5. *C. rosea radiata*
 Perigynia yellowish, brownish or reddish at maturity; the upper spikes aggregated.
 Perigynia not nerved on inner face and not prominently corky thickened at base.
 Perigynia spreading at maturity, reddish tinged, 2.5 mm. wide. 6. *C. gravida*
 Perigynia appressed at maturity, not reddish tinged, 1.25 mm. wide.....7. *C. Hookeriana*
 Perigynia strongly nerved on inner face, corky thickened at base.....8. *C. stipata*
 Spikes very numerous in a compound head.....9. *C. vulpinoidea*

III.

- Perigynia thin or wing margined.
 Bracts leaf-like, many times exceeding head.
 Perigynia subulate, the beak 2–3 times length of body 10. *C. sychnocephala*.

* Shortly before this paper went to the printer, Mr. K. K. Mackenzie revised the species names and wrote this key.

- Perigynia ovate, the beak half length of body.....11. *C. athrostachya*.
 Bracts not leaf-like, shorter than head.
 Scales narrower and shorter than perigynia: the perigynia therefore
 conspicuous in head.
 Perigynia lanceolate, widely spreading; sterile shoots with
 numerous widely spreading leaves.....12. *C. cristatella*.
 Perigynia ovate, not widely spreading; sterile shoots with few
 erect leaves.
 Perigynia less than 4 mm. long.
 Perigynia brownish; spikes closely aggregated, rounded
 at base.....13. *C. Bebbii*.
 Perigynia green; spikes widely separated, the upper clavate
 at base.....14. *C. tenera*.
 Perigynia more than 4 mm. long.....15. *C. brevior*.
 Scales about as wide and as long as perigynia: the perigynia
 therefore not conspicuous in head.
 Heads stiff; spikes approximate.....16. *C. xerantica*.
 Heads slender; spikes widely separate.....17. *C. praticola*.
 Perigynia at most sharp-edged, thick.
 Perigynia widely spreading, less than 3 mm. long.....18. *C. interior*.
 Perigynia appressed, 5 mm. long.....19. *C. Deweyana*.

IV.

- Pistillate spikes very many flowered; perigynia green or straw-colored.
 Lower leaves of fertile culms with long blades; perigynia not papillose;
 culms smooth.....20. *C. aquatilis substricta*.
 Lower leaves of fertile culms with much reduced blades or bladeless;
 perigynia minutely papillose; culms rough.....21. *C. Emoryi*.
 Pistillate spikes few-flowered; perigynia golden yellow at maturity.
 22. *C. aurea*.

V.

- Spikes solitary.
 Spikes androgynous; scales with shining white margins; leaf blades
 acicular.....23. *C. filifolia*.
 Spikes dioecious; scales with dull white margins; leaf blades
 flat.....24. *C. scirpiformis*.
 Spikes several.
 Pistillate spikes suborbicular, few-flowered; perigynia long-tapering
 at base.
 Mature perigynia 2mm. wide or more, the body circular in
 cross-section.....25. *C. heliophila*.
 Mature perigynia 1.5 mm. wide, the body round—triangular in
 cross-section.....26. *C. pennsylvanica*.
 Pistillate spikes oblong, many-flowered perigynia rounded at
 base.....27. *C. lanuginosa*.

VI.

- Perigynia with beak entire or obliquely cut at orifice.

- Bracts with long closed sheaths.
 Perigynia with minute beak.
 Rootstocks slender, long-creeping; scales purplish.
 Scales purplish tinged; perigynia obtusely triangular 28. *C. tetanica*.
 Scales not purplish tinged; perigynia circular in cross-section.
 29. *C. Crawei*.
 Rootstocks densely caespitose; scales not purplish tinged.
 30. *C. Shriveri*.
 Perigynia long beaked.
 Perigynia tuberculate-hispid; culms purple at base, not
 fibrillose; spikes alternate flowered. 31. *C. assiniboinensis*.
 Perigynia smooth; culms brown at base, strongly fibrillose;
 spikes densely flowered. 32. *C. Sprengelii*.
 Bracts sheathless.
 Leaves pubescent; perigynia depressed at apex. 33. *C. abbreviata*.
 Leaves glabrous; perigynia not depressed at apex. 34. *C. Parryana*.
 Perigynia with bidentate beak.
 Pistillate spikes 1 cm. long. 35. *C. viridula*.
 Pistillate spikes 2.5-10 cm. long.
 Perigynia with thick walls, the nerves thick; leaf-sheaths breaking
 and conspicuously filamentose.
 Leaf-sheaths glabrous; perigynia teeth less than 2 mm. long
 36. *C. laeviconica*
 Leaf-sheaths soft hairy; perigynia teeth 2.5 mm. long or more
 37. *C. atherodes*.
 Perigynia with thin walls, the nerves slender; leaf-sheaths not
 filamentose.
 Perigynia finely nerved; scales rough awned; spikes drooping.
 38. *C. hystricina*.
 Perigynia coarsely nerved; scales (except lower) not rough
 awned; spikes erect.
 Perigynia not retrorse; spikes narrowly cylindric. 39. *C. rostrata*.
 Lower perigynia retrorse; spikes oblong. 40. *C. retrorsa*.
213. *Carex stenophylla* Wahl. Kongl. Vet. Akad. Nya Handl.
(II.) 24: 142. (1803).
 Leeds, Pleasant Lake.
214. *Carex camporum* Mackenzie, Bull. Torr. Bot. Club
37: 244. (1910).
 Leeds, Peninsula of Lake Ibsen, Thorne; Dickey Co
 (Brenckle).
215. *Carex Douglasii* Boott; Hook. Fl. Bor. Am. 2: 213
pl. 214. (1840).
 Leeds, Pleasant Lake; Dickinson (Cl. Waldron).
216. *Carex Sartwellii* Dewey, Am. Journ. Sci. 43: 90. (1842).
 Leeds.

217. *Carex rosea radiata* Dewey, Am. Journ. Sci. 10: 276. (1826).
Pleasant Lake, Towner.
218. *Carex gravida* Bailey, Mem. Torr. Club I: 5. (1889).
Devils Lake, Peninsula of Lake Ibsen.
219. *Carex Hookeriana* Dewey, Am. Journ. Sci. 29: 248. (1836).
Butte, Pleasant Lake, Thorne.
220. *Carex stipata* Muhl. Willd. Sp. Pl. 4: 233. (1805).
Pleasant Lake.
221. *Carex vulpinoidea* Michx. Fl. Bor. Am. 2: 169. (1803)
Leeds, Oberon; Kulm (Brenckle).
222. *Carex sychnocephala* Carey, Am. Journ. Sci. (II.) 4: 24. (1847).
Leeds (extinct), the dry bottom of Lake Ibsen.
223. *Carex athrostachya* Olney, Proc. Am. Acad. 8: 393 (1868).
Peninsula of Lake Ibsen (only locality known east of the Rocky Mountains).
224. *Carex cristatella* Britton, Ill. Fl. U. S. and Canada. Vol. I. p. 357. (1896).
Wahpeton (Bergman).
225. *Carex Bebbii* Olney; Bailey, Bot. Gaz. 10: 379. (1885).
Leeds.
226. *Carex tenera* Dewey, Am. Journ. Sci. 8: 97. f. 9. (1824).
Leeds, Peninsula of Lake Ibsen, Butte, Towner.
227. *Carex brevior* (Dewey) Mackenzie, in ed.
Carex straminea var. *brevior* Dewey, Am. Journ. Sci. II: 158. (1826).
Leeds, Butte, Towner, Minot; Kulm (Brenckle).
228. *Carex xerantica* Bailey, Coult. Bot. Gaz. 17: 151. (1892).
Butte.
229. *Carex praticola* Rydb. Mem. N. Y. Bot. Gard. I: 84. (1900).
Leeds, Peninsula of Lake Ibsen.
230. *Carex interior* Bailey, Bull. Torr. Bot. Club, 20: 426. (1893).
Butte, Sheyenne, Towner.
231. *Carex Deweyana* Schwein. Ann. Lyc. N. Y. I: 65. (1824).
Pleasant Lake, Turtle Mountains; Fargo (O. A. Stevens).

232. *Carex aquatilis substricta* Kükenthal, Pflanzenreich IV. 20: 309. (1909).
 Sheyenne.
233. *Carex Emoryi* Dewey, Bot. Mex. Bound. 330. (1858).
 Pleasant Lake, Towner, Minot.
234. *Carex aurea* Nutt. Gen. 2: 205 (1818).
 Devils Lake; Kulm (Brenckle); Dickinson (Cl. Waldron).
235. *Carex filifolia* Nutt. Gen. 2: 204. (1818).
 Butte, Towner.
236. *Carex scirpiformis* Mackenzie, Bull. Torr. Bot. Club 35: 270. (1908).
 Between Rolette and Thorne (extinct).
237. *Carex heliophila* Mackenzie, Torrey, Vol. 13. No. 1. (1913).
 Leeds, Butte, Minot; Kulm (Brenckle).
238. *Carex pennsylvanica* Lam. Encycl. 3: 388. (1789).
 In woods: Devils Lake and Turtle Mountains.
239. *Carex lanuginosa* Michx. Fl. Bor. Am. 2: 175. (1803).
 Leeds, Butte, Willow City, Towner.
240. *Carex tetanica* Schkuhr. Riedgr. Nachtr. 68, figs. 100 and 207. (1806).
 Leeds, Thorne, Sheyenne.
241. *Carex Crawei* Dewey, Am. Journ. Sci. (II.) 2: 246. (1846)
 Towner.
242. *Carex Shriveri* Britton, Manual 208. (1901).
 Butte.
243. *Carex assiniboinensis* W. Boott, Coult. Bot. Gaz. 9: 91. (1884).
 Peninsula of Lake Ibsen, Towner.
244. *Carex Sprengelii* Dewey, Spreng. Syst. 3: 827. (1826).
 Peninsula of Lake Ibsen, Devils Lake, Pleasant Lake, Dunsieith.
245. *Carex abbreviata* Prescott; Boott, Trans. Linn. Soc. 20: 141. (1846).
 Butte.
246. *Carex Parryana* Dewey, Am. Journ. Sci. 27: 239. (1835).
 Leeds (extinct), Towner.
247. *Carex viridula* Michx. Fl. Bor. Am. 2: 170. (1803).
 Sheyenne, Towner.
148. *Carex laeviconica* Dewey, Am. Journ. Sci. 24: 47, (1857).

Leeds, Towner, Minot; Mandan (Bergman).

249. *Carex atherodes* Spreng. Syst. 3: 828. (1826).

Leeds.

250. *Carex hystericina* Muhl., Willd. Sp. Pl. 4: 282. (1805).
Pleasant Lake, Towner.

251. *Carex rostrata* Stokes, With. Arrang. Brit. Pl. (2 ed.)
2: 1059. (1787).

252. *Carex rostrata* Stokes, var. *utriculata* (Boott.) Bailey,
Proc. Am. Acad. 22: 67. (1886).

Leeds, Sheyenne, Towner.

253. *Carex retrorsa* Schwein, Ann. Lyc. N. Y. I: 71. (1824).

Along Oak Creek at Bottineau; Renville Co.: Tolley (O.
A. Stevens).

Order 10. LEMNALES.

Family 15. **LEMNADEAE** S. F. Gray, Nat. Arr. Br. Pl.
II, p. 729. (1821).

HYDROPHACE Haller, Helv. 3: 68. (1768).

Lemna Dalechamps (1580), Linn. Syst. (1735), Gen. 325.
(1737) and 417. (1754), Sp. Pl. 970. (1753), not *Lemna* or *Lemna*
Theophr. = *Marsilea vulgaris* Linn.

254. *Hydrophace trisulca* (Linn.) Bubani, Fl. Pyr. IV,
p. 23. (1901).

Lemna triculca Linn. Sp. Pl. 970 (1753).

Leeds, Butte.

255. *Hydrophace perpusilla* (Torr.) Lunell.

Lemna perpusilla Torr. Fl. N. Y. 2: 245. (1843).

Butte; Fargo (L. R. Waldron and F. F. Manns).

Order 11. AROIDEAE.

Jussieux Gen. Pl. 23. (1789). Bartling, Ord. Nat. Pl. 25. (1830).

Family 16. **ARACEAE** Necker, Act. Acad. Theod. Palate
2: 462. (1770).

ARISAEMA Martius, Flora 14: 459. (1831).

Arum Linn. Syst. (1735), Gen. Pl. 277. (1737), 431. (1754),
Sp. Pl. 964. (1753), in part.

256. *Arisaema triphyllum* (Linn.) Torr. Fl. N. Y. 2: 239.
(1843).

Arum triphyllum Linn. Sp. Pl. 965. (1753). Fargo (Bergman).

Order 12. XYRIDALES.

Britton, Man. 2nd ed. p. 234. (1905).

Family 17. **COMMELYNEAE** R. Brown (1810).

TRADESCANTIA Linn. Syst. (1755); Gen. Pl. 98. (1737), 37. (1742), 38. (1754); Hort. Cliff. 126. (1737); Sp. Pl. 288. (1753); Van. Royen. Lugd. 37. (1740).

257. *Tradescantia ramifera* Lunell, Am. Midl. Nat. Vol. II: 124, (1911).

Sand Hills (McHenry Co.); Pleasant Lake.

258. *Tradescantia occidentalis* Britton, Rydb. Mem. N. Y. Bot. Gard. I: 87. (1900).

Fargo (Cl. Waldron).

Family 18. **PONTEDEREAE** H. B. K. Nov. Gen. et Sp. I: 265. (1815).

HETERANTHERA R. et P. Fl. Peruv. et Chil. Pr. 9. (1794).

259. *Heteranthera dubia* (Jacq.) McM., Met. Minn. p. 138. (1892).

Jamestown; Wahpeton (Bergman).

Order 13. **LILIALES.**

Britton, Man. 2nd ed. p. 244. (1905), in part.

Family 19. **JUNCOIDEAE** Gerard, Fl. Gall. Pr. p. 138. (1761).

JUNCUS Plinius, Hist. Nat. and all prae-Linnaean writers.

Juncus Tour. Êls. 212. (1694); I. R. H. 246. (1700); Linn. Syst. (1735), Gen. Pl. 104. (1737), 150. (1742), 152. (1754), Sp. Pl. 325. (1753).

260. *Juncus balticus* Willd. Berl. Mag. 3: 298. (1809).

Leeds.

261. *Juncus bufonius* Linn. Sp. Pl. 398. (1753).

Leeds, Jamestown.

262. *Juncus Vaseyi* Engelm. Trans. St. Louis Acad. 2: 448. (1866).

Butte.

263. *Juncus longistylis* Torr. Bot. Mex. Bound. 223. (1859).

Leeds, Butte, Pleasant Lake.

264. *Juncus nodosus* Linn. Sp. Pl. Ed. 2, 466. (1762).

Leeds, Butte, Towner.

265. *Juncus nodosus* var. *genuinus* Engelm.

Benson Co., acc. to specimen deposited in the Gray Herbarium by the writer in 1906.

266. *Juncus nodosus* var. *proliferus* Lunell. var. nov.

In locos florum folia substituta sunt. The flowers are replaced by tufts of leaves. In a cold bog among the species. Butte.

267. *Juncus Torreyi* Coville, Mem. Torr. Bot. Club, 22: 303. (1895).

Leeds, Butte.

268. *Juncus Torreyi* var. *proliferus* Lunell. var. nov.

In locos florum folia substituta sunt. The flowers are replaced by tufts of leaves. In a swamp among the species. Butte.

269. *Juncus brachycephalus* (Engelm.) Buchenau in Engler, Bot. Jahrb. 12: 268. (1890).

Juncus canadensis var. *brachycephalus* Engelm. Trans. St. Louis Acad. 2: 474. (1868).

Towner, Fort Totten.

270. *Juncus Dudleyi* Wiegand, Bull. Torr. Bot. Club, 27: 524. (1900). *J. tenuis* Coult. in part, not Willd.

Leeds, Butte, Towner, St. John.

- Family 20. **MELANTHACEAE** R. Br. Prodr. I: 272. (1810).

ANTICLEA Kunth.

Zygadenus Michx. Fl. Bor. Am. I: 213. (1803), in part.

271. *Anticlea elegans* (Pursh) Rydb. Fl. of Colo. 76. (1906)

Zygadenus elegans Pursh. Fl. Am. Sept. 241. (1814).

Leeds, Butte, Thorne, Barton, Minot.

ŌAKESIA Wats.

272. *Oakesia sessilifolia* (Linn.) Wats. Proc. Am. Acad. 14: 269. (1879).

Uvularia sessilifolia Linn. Sp. Pl. 305. (1753).

Fargo (Bergman).

- Family 21. **ALLIACEAE** Bartsch, also Dum. An. Fam. 61. (1829). *Cepaeae* Salisb. Gen. Pl. Lir. 88. (1866).

Allieae Kunth. Enum. Pl. 4, p. 379. (1843).

CEPA Virgilius Mov. 84. Columella. *Cepulla* Pall. Fil. ex. Oct. 11. *Krommuon* Theophr. VII: 14, Diosc. II: 181. *Cepa vulgaris* Bauhin Pin. II: 1, and of nearly all other writers. Onion of the ancients.

273. *Cepa rubens* Virgilius l. c.

Allium Cepa Linn. Sp. Pl. 294. (1753).

Probably escaped. Railroad ditch, Thorne.

ALLIUM (garlic of the ancients) Plinius, Tournef. Éls. Bot. p. 304. (1694). I. R. H. 383. (1700). Linn. Syst. (1735). Gen. 103. (1737), 141. (1742), 143. (1754). Royen, Hort. Lugd. 38. (1740), and prae-Linnaeans. *Allium sativum* Linn. Sp. Pl. 425. (1753) = garlic.

274. *Allium stellatum* Ker. Bot. Mag. Pl. 1576. (1813).
Lees, Butte; Kulm (Brenckle).
275. *Allium Geyeri* S. Wats. Proc. Am. Acad. 14: 227. (1879).
Allium reticulatum deserticola Jones (?).
Pleasant Lake, Dunsieith, Towner, Minot.
276. *Allium reticulatum* Don. Mem. Vern. Soc. 6: 36. (1826-31).
Leeds, Butte.
- Fam. 22. **LILIACEAE** Clusius, Panon 231. (1585). Linn.
Phil. Bot. 28. (1751), 28. (1755); Zinn, Cat. Pl. Gott. 89. (1754);
Haller, Enum. Pl. Hort. Gott. 19. (1753).
- LILIUM* Plinius, Virgilius, Colum. X: 99, Linn. Gen. Pl.
91. (1737), 142. (1742), 143. (1754), Sp. Pl. 302. (1753).
277. *Lilium umbellatum* Pursh, Fl. Am. Sept. 229. (1814).
Lilium andinum Nutt. Fras. Cat. (1813) nomen nudum.
Leeds, Butte, Oberon.
278. *Lilium tigrinum* Andr. Bot. Rep. 9. (1809).
Subspontaneous. Leeds.
- FRITILLARIA* Linn. Sp. Pl. 803. (1753).
279. *Fritillaria atropurpurea* Nutt. Journ. Acad. Phila. 7:
54. (1834).
Medora (Cl. Waldron).
- CALOCHORTUS* Pursh, Fl. Am. Sept. 240. (1814).
280. *Calochortus Nuttallii* T. et G. Pac. R. R. Rep. 2:
124. (1855).
Sentinel Butte (Bergman), Medora (Bergman).
- YUCCA* Linn. Sp. Pl. 319. (1753).
281. *Yucca glauca* Nutt. Fraser's Cat. (1813).
Morton Co.: Wade (Bell).
- Family 23. **BACCIFERAE** Haller, Fl. Helv. 2: 116. (1768).
Convallariaceae Link. Handb. I: 184. (1829).
Subfamily *Asparagoideae* Vent. Tabl. 2: 141. (1799).
- ASPARAGUS* Diosc. 2: 151. Juvenalis, Sat. 5: 82, 9: 69,
Theophr. Plinius, Fuchsius, Cordus, Tour. Éls.; I. R. H.; Linn.
Syst., Hor'. Cliff., Gen., Sp. Pl. 313. (1753).
282. *Asparagus hortensis* Marcellus Virgilius, in Dios. Com.
260. (1529).
Asparagus officinalis Linn. Sp. Pl. l. c.
Leeds, Butte.
- Subfamily *Maianthemaeae* Dum. Fam. des Pl. 60. (1829).
- VAGNERA* Adanson, Fam. des Pl. 2: 496. (1763).

- Smilacina* Desf. Ann. Mus. Paris 9: 51. (1807).
 283. *Vagnera racemosa* (Linn.) Morong, Mem. Torr. Bot. Club 5: 114. (1894).
Smilacina racemosa Desf. l. c.; *Convallaria racemosa* Linn. Sp. Pl. 315. (1753).
 Fargo (Bergman).
ASTERANTHEMUM Kunth. Enum. Pl. V, p. 151. (1850).
Vagnera Adanson, l. c., segregate.
 284. *Asteranthemum stellatum* (Linn.) Nwd. Am. Midl. Nat. Vol. III: 109. (1913).
Convallaria stellata Linn. Sp. Pl. 316. (1753).
Smilacina stellata Desf. Am. Mus. Paris 9: 52. (1807).
Vagnera stellata Morong, Mem. Torr. Club V: 114. (1894).
Asteranthemum vulgare Kunth l. c. p. 152
 Leeds, Butte, Devils Lake.
UNIFOLIUM Brunsvigius (1500), Tragus Stirp. Hist. (1552), Dodonaeus Pempt. 20. (1583), Adanson. Fam. Pl. 2: 54. (1763).
Maianthemum Wigg. Prim. Fl. Holsat. 14. (1780).
 285. *Unifolium canadense* (Desf.) Greene, Bull. Torr. Bot. Club 15: 287. (1888).
Maianthemum canadense Desf. Ann. Mus. Paris 9: 54. (1807).
 Turtle Mountains: St. John, Dunsieith.
 Subfamily *Polygonateae* Bentham, Benth. et Hook. Gen. III: 752. (1883).
POLYGONATUM Diosc. 4: 6. Tour. Éléments 69. (1694).
 Adanson, Fam. Pl. 2: 54. (1763).
Salomonina Heister, Syst. 5. (1748).
 286. *Polygonatum commutatum* (R. et S.) Dietr.; Otto et Dietr. Garteng. 3: 223. (1835).
Polygonatum giganteum Dietr. l. c. 222. (1835).
Convallaria commutata R. et S. Syst. 7: 1671. (1830).
 Devils Lake, Peninsula of Lake Ibsen.
DISPORUM Salisb. Trans. Hort. Soc. I: 331. (1812).
Prosartes Don. Ann. Nat. Hist. 4: 341. (1840).
 287. *Disporum trachycarpum* (S. Wats.) B. et H. Gen. Pl. 3: 832. (1883).
Prosartes trachycarpa S. Wats. Bot. King's Exp. 344. (1871).
 Turtle Mountains: St. John, Dunsieith.
 Family 24. **TRILLIACEAE** De Candolle Ess. Med. 294. (1816)
TRILLIUM Linn. Sp. Pl. 339. (1753), Gen. Pl. 158. (1754).

288. *Trillium cernuum* Linn. Sp. Pl. 339. (1753)

Fargo (Bergman). Turtle Mountains: St. John.

Family 25. **SMILACEAE** Vent. Tabl. Reg. Veg. 146. (1799).

NEMEXIA Rafinesque, Neogenyton 3. (1825).

Smilax Linn. Sp. Pl. 1028. (1753), in part.

289. *Nemexia lasioneuron* (Hook.) Rydb. Bull. Torr. Bot. Club (1905), p. 610.

Nemexia herbacea (Linn.) Small, var *melica* A. Nels. Proc. Biol. Soc. Wash. 17: 175. (1904).

Souris River near Towner.

290. *Nemexia pulverulenta* (Michx.) Small in Fl. SE. U. S. 281. (1903).

Smilax pulverulenta Michx. Fl. Bor. Am. 2: 238. (1803).

Peninsula of Lake Ibsen, Towner, Turtle Mountains.

Family 26. **HYPOXIDEAE** R. Brown. Fl. Voy. 277. (1814).

HYPOXIS Linn. Syst. ed. 10, 2: 986. (1759).

291. *Hypoxis hirsuta* (Linn.) Coville. Mem. Torr. Bot. Club 5: 118. (1894).

Ornithogalum hirsutum Linn. Sp. Pl. 306. (1753).

Hypoxis erecta Linn. Syst. Ed. 10, 2: 986. (1759).

McHenry Co.: Sand Hills; Leeds, Butte.

Order 14. **ENSATAE.**

Bartling Nat. Ord. p. 40. (1830).

Family 27. **IRIDEAE** Vent. Tabl. Reg. Veg. 188. (1799).

BERMUDIANA Tournefort, Éléments 306. (1694); I. R. H.

387. (1700); Linn. Syst. (1735); Adanson, Fam. II: 60. (1763).

Sisyrinchium Linn. Gen. 273. (1737), 436. (1742), 409. (1754).

Sp. Pl. 954. (1753), not Tour. and older authors = *Iris*.

292. *Bermudiana angustifolia* (Mill.) Nwd. Am. Midl. Nat. Vol. III. p. 115. (1913).

Sisyrinchium angustifolium Mill. Gard. Dict. ed. 7. (1759).

Leeds, and almost everywhere in the state.

293. *Bermudiana mucronata* (Michx.) Lunell.

Sisyrinchium mucronatum Michx. Fl. Bor. Am. 2: 33. (1803). Butte.

294. *Bermudiana septentrionalis* (Bicknell) Lunell.

Sisyrinchium septentrionale Bicknell, Bull. Torr. Bot. Club 27: 243. (1900).

A Canadian plant. Leeds is the only locality from which it is known within the United States.

Order 15. SYNANDRAE.

Agardh. Aphor. p. 179. (1823).

Family 28. ORCHIDEAE Haller, Enum. St. Helvet. I: 262. (1742).

Subfamily *Cypripedieae* Lindl. Orchid. Sal. 7-18. (1826).

CALCEOLUS (Rivinus) Tournefort, Éléments 343. (1694); I. R. H. 436. (1700); Zinn. Cat. 85. (1757); Adanson Fam. II: 70. (1763); *Calceolaria* Heister, Syst. 5. (1748); *Cypripedium* Linn. Syst. (1735). Gen. 272. (1737), 435. (1742), 408. (1754), Sp. Pl. 951. (1753).

295. *Calceolus hirsutus* (Miller) Nwd. Am. Midl. Nat. Vol. III. p. 118. (1913).

Cypripedium hirsutum P. Miller, Gard. Dict. Ed. 8, No. 3. (1763).

Cypripedium pubescens Willd. Sp. Pl. 4: 143. (1803).
Fort Totten (Bergman).

296. *Calceolus parviflorus* (Salisb.) Nwd. l. c.

Cypripedium parviflorum Salisb. Trans. Linn. Soc. 1: 77. (1791).
Leeds, Pleasant Lake.

Subfamily *Ophrydeae* Lindley, Orchid. Scel. 96. (1826).

ORCHIS Theoph. Hist. 9: 19. Also Diosc. 3: 131, 132, Pliny 27. 8, 26: 10, as also of all older writers though often translated into Latin name. *Orchis* Tour. Élé. 343. (1694). I. R. H. 431. (1700) Linn. Syst., (1735) Gen. 270 (1737), 405 (1754).

297. *Orchis rotundifolia* Pursh, Fl. Am. Sept. 588. (1814).

Platanthera rotundifolia Lindl. Gen. & Sp. Orch. 292. (1835).
Devils Lake, fide M. U. Brannon.

LIMNORCHIS Rydb., Mem. N. Y. Bot. Gard. I: 105. (1900).

Habenaria Willd. Sp. Pl. 4: 44. (1805).

298. *Limnorchis hyperborea* (Linn.) Rydb. l. c.

Habenaria hyperborea (Linn.) R. Br. Ait. Hort. Kew. ed. 2, 5: 193. (1813).

Orchis hyperborea Linn. Mant. 121. (1767).

Butte, Pleasant Lake, Dunsieith, Willow City.

COELOGLOSSUM Hartman, Handb. Skand. Fl. I: 329. (1820).

Habenaria Willd. l. c., segregate.

299. *Coeloglossum bracteatum* (Willd.) Part. Fl. Ital. III: 409.

Habenaria bracteata (Willd.) R. Br. Ait. Hort. Kew. l. c. 192.

Orchis bracteata Willd. Sp. Pl. 4: 34. (1805).

Butte; Turtle Mountains.

Subfamily *Neottiinae* Pfitz. *Entwick. Anord. Orch.* 45. 97. (1887).

TRIORCHIS Bauhin, *Phytopinax* 123. (1596); Gerard, *Herbal* (1597); C. Bauhin, *Pinax* 84. (1623); Tabernaemontanus. *Gyrostachys* Pers. *Syn.* II: 511. (1807). *Ibidium* Salsb., *Trans. Hort. Soc.* 1: 291. (1812). *Spiranthes* L. C. Richard *Mem. Mus. Paris* 4: 42. (1818).

300. *Triorchis stricta* (Rydb.) Lunell.

Gyrostachys stricta Rydb. *Mem. N. Y. Bot. Gard.* 1: 107. (1900).

Leeds (extinct), Butte (extinct), Towner, Devils Lake.

Subfamily *Liparididae* Lindl. *Veg. King.* 181. (1847).

CORALLORHIZA Ruppius, *Fl. Jen.* (1718); R. Br. *Ait. Hort. Kew. ed. 2*, 5: 209. (1813); Gmel. *Fl. Sib.* I, op. 25. (1747); Haller, *Hist. Stirp. Indig. Helv.* 11: 159. (1768), also 248. (1742).

301. *Corallorhiza trifida* Chat.

Ophrys Corallorhiza Linn. *Sp. Pl.* 945. (1753).

Corallorhiza innata R. Br. l. c.

Corallorhiza Corallorhiza (Linn.) Karst. *Deutsch. Fl.* 448. (1880-83).

Pleasant Lake.

CORRECTIONS.

Page 221, lines 7 and 8: for *ciliare* . . . *ciliaris* read *cilianense* . . . *cilianensis*.

Page 224, line 14: *Gnomonia* is not valid, being antedated by *Gnomonia*, genus name of a fungus. Substitute *HOROLOGION* (gr. ὁρολόγιον, fescue, dial).

THE NAIADES OF MISSOURI.—IV.

BY WILLIAM I. UTTERBACK.

Uniomerus tetralasmus (Say).

("Pond Horn Shell.")

Pl. XXI, Figs. 69 A and B.

1830—*Unio tetralasmus* Say, *Am. Conch.*, III, pl. XXIII.

1836—*Unio declivis* Conrad, *Monog.*, V, p. 45, pl. XXIII, fig. 1.

1839—*Unio sayi* Ward, (in Tappan). *Am. Jl. Sci.*, XXXV, p. 268, pl. III, fig. 1.

1912b—*Uniomorus tetralasmus* (Say) Ortmann, An. Car. Mus., VIII, pp. 272 and 273.

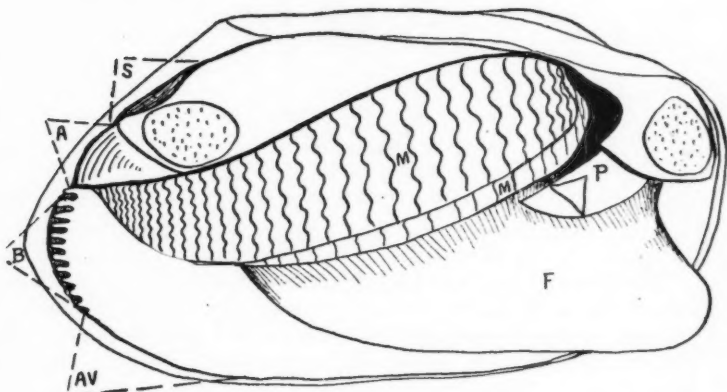
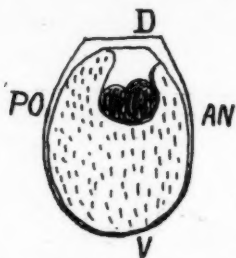


FIG. 4. *Uniomorus tetralasma* (Say) ♀. Diagram of a gravid individual from Lost Cr., Amity, showing animal characters in left valve. Coll. May 3, 1913. ($\frac{3}{4}$ nat. size.)

ANIMAL CHARACTERS.

NUTRITIVE STRUCTURES:—Branchial opening large, set with numerous papillae; anal finely crenulate on inner edge; supra-anal large extending to dorsal line, closed from anal by a moderate mantle connection; gills about the same width, inner longer, inner laminae free from visceral mass for whole length except for a short distance anteriorly; palpi short and broad, connected only for one-fourth of their length antero-dorsad; color of soft parts, for most parts, a dingy white with mantle edge at siphonal openings blackish, gills brown.

REPRODUCTIVE STRUCTURES:—Marsupia only occupying outer gills, when charged rather padiform, distended at center, but not near the ventral edges, ovisacs simple, undivided; conglutinates also undivided, white, sole-shaped, with regular thin transparent areas arranged cross-wise made by the thickening of the septa at regular intervals; glochidia spatulate, very regular in outline, hinge line short and straight, medium in size measuring 0.160×0.210 mm.

FIG. 5. Mature closed glochidium of *U. tetralasma*. (x87)

SHELL CHARACTERS.

EXTERNAL STRUCTURES:—Shell subtrapezoid; post-dorsal ridge rather high, usually obtusely pointed behind, evenly rounded in front; disk smooth; beaks low, drawn well back from anterior end, sculptured with many coarse, concentric, regular ridges curved up very abruptly behind at base of post-umbonal ridge where the ridges are drawn closely together; epidermis light yellow back ground with alternated brown bands running parallel with the growth lines, or nearly all colored in brown horn with polished appearance, almost rayless, sometimes faintly rayed in green on post-umbonal ridge.

INTERNAL STRUCTURES:—Cardinals compressed into rather blade-like processes; laterals delicate but rather prominent; interdentum long, thin; umbonal cavities rather shallow; scars well impressed, nacre light bluish to grayish.

Sex	Length	Height	Diameter	Um. ra.	Locality
♂	95	x 45	x 31	mm 0.260	(Batterton Pond, Columbia)
♀	88	x 44	x 32	" 0.265	(Lost Creek, Amity)
♀	76	x 42	x 24.5	" 0.260	(Mill Creek, Courtney)
♀	23	x 12	x 8	" 0.270	(Lost Creek, Amity)

MISCELLANEOUS REMARKS:—*U. tetralasma* is peculiar ecologically, as well as morphologically, in that it can become more quickly established in artificial ponds and lakes than any species. It is naturally lacustrine, but for some unknown cause it is not found in any of our lakes preferring small ponds or quiet creeks where it is found accompanying *Anodonta Danielsii*, or *Eurymia subrostrata*. From the fact that the writer has not found any individuals of this species in North Missouri without marsupial characters he is led to believe that it is locally hermaphroditic at

any rate. The writer, too, has had the good fortune to find its glochidium for the first time and is figured here in this catalogue for the first (See Text fig. 5). Many were taken from Lost Creek of the Grand River drainage, May 3d, and also August 5th, most of which were gravid with glochidia on both occasions. Although winter observations have not as yet been made, still we would judge from these two records that this species is not tachytictic as in most *Unioninae*. However, like most of the members of this Sub-Family their conglutinates are "aborted" when removed from their natural bed. Simpson speaks of this species as being very susceptible to variation; however, the writer has not noticed any great variability in this State, where its distribution is rather wide, and has not seen any varieties worth listing except *comptodon*, which has also been reported for Central Missouri by Dr. Britts.

***Uniomorus tetralasmus comptodon* (Say).**

("Pond Horn Shell.")

Not figured.

1832—*Unio comptodon* Say, An. Conch., V, pl. XIII.

1832—*Unio geometricus* Lea, Tr. Am. Phil. Soc., V, p. 28, pl. IV, fig. 10.

ANIMAL CHARACTERS are the same as those of the species; so are also its shell characters except in its outline being more rhomboid, its epidermis being more of a dull drab—or uni-color in having more roughened growth lines and a more curved hinge line.

Sex	Length	Height	Diameter	Locality
♀	80	x 40	x 25 mm	(Grindstone Creek, Maysville)
♀	75	x 40	x 24 "	(Lost Creek, Amity)
♀	63	x 33	x 20 "	(" " ")

MISCELLANEOUS REMARKS:—This variety is often found in the same bed with the species from which it is discriminated, as above indicated, by the character of its epidermis. On this superficial basis of epidermis color there are so many intergrades and for this reason it may be doubted whether this and other recorded varieties are really worthy of their names. *Comptodon* was collected by Dr. Britts in Clinton Co., and is now on exhibit in the Division of Mollusks of the U. S. National Museum under the number, 150402. According to Henderson (1907, p.87, pl. ii, figs. 7a and 7b) this variety predominates over the main species in Colorado. Dr. Scammon (1906, p. 337) reports it for Neosho County, Kansas. The writer has examined both sterile and gravid

specimens of this form to find it with the same breeding season as its parent species.

II—SUB-FAMILY *Anodontinae* Ortmann.

1911a—*Anodontinae* Ortmann, An. Car. Mus., IV, p. 336; 1912b, An. Car. Mus., VIII, pp. 278–300.

ANIMAL CHARACTERS:—Mantle edge, antero-ventrad to branchial opening smooth without specialized structures; supra-anal antero-dorsad to anal opening usually widely separated; no tendency toward tubular siphonal openings; inner laminae of inner gill generally free from visceral mass; region just anterior to pericardium of watery composition; palpi very large; marsupia—occupying two entire outer gills, when gravid pad-like, enormous, tissue thickened at edge to permit transverse distention, two water tubes present on either side of an enclosed central undivided ovisac and facing outer and inner laminae, these laminae very thin and delicate rupturing at the slightest scratch; glochidia usually large, spadiform, generally longer than high, with a spine at each ventral tip; no well-defined conglomerates, but held together in unstable masses by brownish mucus and a tangle of larval threads.

SHELL CHARACTERS:—Shell thin for the most part; disk usually without sculpturing; beaks usually coarsely sculptured with concentric or double-looped ridges; hinge variable, teeth completely lacking, or, if present, rudimentary or peculiar; beak cavities not deep as a rule; sexual dimorphism rarely seen.

MISCELLANEOUS REMARKS:—The members of this group have a long period breeding season (bradytictic) due perhaps to their origin at a time, as Dr. A. E. Ortmann considers, when a possible shortening of the warm season induced them to retain their embryos in the marsupia and discharge the glochidia in the spring; hence, the constant and admirable adaptation of water-tubes for the aeration of the embryos in the marsupia while being retained for that time. This adaptation elevates this group from the primitive one and places it more among the modern Unionidae. Even on the basis of shell structure, in that the sculpturing, seen on the disk of the shells of the *Unioninae*, is carried back up to the umbona region where it is almost exclusively confined, there is sufficient evidence for the more modern grouping. The inability of the *Anodontinae* to spread their valves very wide may account for

the lack of papillae or other specialized structures (as related to the processes of reproduction) in the region of the branchial openings. Since the species of this group are mostly lacustrine we find them, of course, mostly distributed in the chain of lakes along the Missouri River or in the ponds and small sluggish streams of the interior of the state north of the Missouri River. Compared to the other sub-families, we do not find so many variations in this Sub-Family due to the more constant ecological conditions to which the *Anodontine* species are remarkably constant—especially as to reproductive structures, in which respect they differ from those of the *Lampsilinae*; however, the *Anodontine* species are like the *Unionine* in the possession of large palpi, whereas those of the *Lampsilinae* species are small. In all probability the larger palpi are for reproductive as well as nutritive purposes. It is interesting to note the recapitulation of the evolution of the whole race of *Naiades* in some of the individual members of this Sub-Family in that the coarse sculpturing, noted on the disk of juvenile shells, is carried back up to the umbones in mature shells—a progression from the sculptured disk of the more primitive to the smooth disk of the more modern forms of the adult.

Genus, *Symphynota* Lea.

1829—*Symphynota* Lea, Tr. Am. Phil. Soc., III, p. 424.

(Type, *Symphynota compressa* Lea)

ANIMAL STRUCTURES:—Branchial opening with short papillae; anal smooth, or finely crenulated; supra-anal larger or smaller than anal, separated by more or less long mantle connection; gills bowed ventrad, septa and water-tubes well developed, inner lamina of inner gills free from visceral mass; marsupium occupying outer gills, pad-like and with secondary water tubes, when charged; glochidia large, spadiform, spined, hinge line undulate; palpi sickle-like united for one-half of their length anterio-dorsad; color of soft parts usually yellowish.

SHELL CHARACTERS:—Shell elliptical to oval, compressed, smooth except for costae sometimes on posterior dorsal ridge; beak sculpture double looped, or sinuate-concentric; cardinals always present; laterals imperfect, or even absent; nacre white or bluish.

MISCELLANEOUS REMARKS:—The shell characters of *Symphynota* would relate it more closely to the more primitive group than

any of the *Anodontinae* on account of its sculpturing on the posterior dorsal ridge, the costae there being somewhat similar to those on the shell of some *Amblemae* or *Quadrulae*. Simpson treated this genus under three sub-genera and while the shell characters may greatly differ, yet, *the animal characters are so constant and the known species are so few to retain this subgeneric treatment*. The type, *S. compressa* (Lea), is not found in this state—not even in the Mississippi River. Only two species of this genus, *S. complanata* (Barnes) and *costata* (Rafinesque), are found in Missouri and they are not widely distributed, the former being confined mostly to the north and the latter to the south part of the state.

***Symphynota complanata* (Barnes).**

("Heel Spitter," "Hackle Back," "Hatchet Back," "Pan-cake.")

Pl. XXII, Figs. 70 A and B.

1823—*Alasmodonta complanata* Barnes, Amer. Jour. Sci. and Arts, p. 278, pl. XIII, fig. 21.

1900b—*Symphynota complanata* (Barnes) Simpson, Proc. U. S. Nat. Mus., XXII, pp. 665-666.

ANIMAL CHARACTERS.

NUTRITIVE STRUCTURES:—Branchial opening thickly set with short papillae; anal finely dentate; anus of intestine fringed with three or four papillae; supra-anal large, mantle connection widely separating it from anal; inner gills, wider than outer, inner laminae free except briefly, anteriorly; marsupia occupy entire outer gills, truncated along ventral margin when charged, ovisacs not divided; glochidium very large, spined, hinge line undulate measures 0.310 x 0.320mm; most of soft parts yellowish, gills rusty color when gravid.

SHELL CHARACTERS.

EXTERNAL STRUCTURES:—Usually rhomboidal, compressed; alae high, marked with a few upcurved costae; disk smooth; beaks low, sculptured with coarse double-looped ridges; epidermis of young shell reddish with brown rays; of old specimens, brown to black.

INTERNAL STRUCTURES:—Cardinals single in right, double in left valve; laterals faintly double in both valves; umbonal cavity shallow; nacre bluish to satiny white with marginal ribbon of

lavender; sexual dimorphism not very distinct; the biangular character clined for posterior end of male shell not constant.

Sex	Length	Height	Diameter	Um. ra.	Locality
♀	170	x 105	x 72mm	0.26	(Big Mud Lake)
♂	175	x 105	x 55 "	0.26	(Platte R.)
♀	100	x 65	x 29 "	0.20	(" ")
♀	88	x 55	x 25 "	0.20	(102 River)

The juvenile shell is very flat, a very beautiful wine-colored epidermis marked with bright brown rays: beaks are coarse, marked with the characteristic sculpturing of adult shell except the later bars are down on the upper part of the disk; nacre bluish.

MISCELLANEOUS REMARKS:—This species is both fluviatile and lacustrine for this state. *Observation of aquarium specimens discharging sperm proves this species a gonochorist*—a character this is opposite to the congeneric species and type of this group, *compressa* Lea. The author has also observed this species to be gravid with glochidia from November to April and, in most instances, has noted early and late embryos mingled with the glochidia in the same individual at the same time. This species is very common in North Missouri where it grows very large in the lakes, but is uncommon and dwarfed in Central Missouri and is not found at all in the clear, swift water-streams of South Missouri. *Complanata* is so distinct from other alated forms that there should be no confusion. It differs from *Proptera alata* (Say) in that the latter is dimorphic more inflated and has a purple nacre. There is such difference between this species and the type (*S. compressa*) that it may well deserve its subgeneric name, *Pterosygna* Raf. (1813), that Simpson applied.

Symphynota costata (Rafinesque).

("Fluted Shell," "Squaw Foot," "Sand Mussel.")

Pl. XXII, Figs. 71 A—F.

- 1820—*Alasmidonta costata* Rafinesque, Ann. Gen. Sci. Brux., p. 318, Pl. LXXXII, fig. 15, 16.
- 1823—*Alasmidonta rugosa* Barnes, Am. Jour. Sci. and Arts, p. 278, pl. XIII, fig. 21.
- 1900b—*Symphynota costata* (Raf), Simpson, Proc. Nat. Mus., XXII, p. 665.

ANIMAL CHARACTERS.

NUTRITIVE STRUCTURES:—Anal opening slightly crenulated on inner margin; supra-anal moderately separated from anal;

inner gills larger, much wider anteriorly, inner lamina free from visceral mass nearly whole length; palpi not large, triangular, united partly antero-dorsad.

REPRODUCTIVE STRUCTURES:—Marsupium typically Anodontine; glochidium next to largest on record (0.380 x 0.390mm) wider than long, hinge line undulate; soft parts yellow; marsupium, however, rich brown when charged.

SHELL CHARACTERS.

EXTERNAL STRUCTURES:—Shell moderately large, thin to moderately thick, elongate, compressed (especially in male), posterior end bi-angulate, costae on slopes of post-dorsal ridge; disk without sculpturing; umbones peculiarly marked with four coarsely mingled concentric and double-looped bars; epidermis from light horn-color to dark chestnut in old specimens, greenish and rayed in young.

INTERNAL STRUCTURES:—Cardinals single in right, rather tripartite in left valve and interdentum deeply notched; laterals almost obliterated; nacre deep rich cream in umbonal cavity, while lavender and blue on pallial border, often whole nacreous surface yellowish or ferruginous due to a distomid infection to which this species is so susceptible.

SHELL MEASUREMENTS.

Sex	Length	Height	Diameter	Um. ra.	Locality
♀	116	x 85	x 44mm	0.370	(Gascondy, Mo., Gasconade R.)
♂	125	x 56	x 35 "	0.280	(Black R., Williamsville, Mo.)
♀	100	x 52	x 32 "	0.275	(Miss. R., LaGrange, Mo.)
	75	x 42	x 24 "	0.280	(St. Francis R., Greenville)

MISCELLANEOUS REMARKS:—*S. costata* is found in sandy and muddy situations, is a deep burrower and very active. With this habitat and physiological characters it is strange that it should not be found at all in the sluggish muddy streams of North Missouri and very rarely in Central Missouri where the streams are intermediate for clearness and current. Perhaps this species has the most variegated nacre of any *Naiad* shell. It is a very common species in the clear and rapid streams of the Ozark Plateau and Center where its shell is duller epidermis than those of the Mississippi. (See *Pl. xxii, Figs. 71 A—F.*) This compression and plication are due, doubtless, to swifter current and more rocky bottom.

Its general distribution is for the St. Lawrence drainage and in the Mississippi as far south as Texas. This species can be easily identified and distinguished from other shells by rugose or ribbed structure on the abrupt slopes of the post-dorsal ridge, by its peculiar deep socket just underneath the beak, by its comparatively unridged laterals, but, most of all, by its very characteristic compound beak sculpturing. Because of these very striking shell characters it may deserve the subgeneric treatment of Simpson (1900b p. 664) who gave this species the name *Symphynota* (*Lasmigona*) *costata* (Raf.) Dr. Ortmann and Mr. Frierson think this subgenus, *Lasmigona*, really deserves generic rank. The author has found the breeding season of *costata* to extend from August until May with eggs and early embryos for late summer and fall and glochidia for winter and spring.

Genus *Arcidens* Simpson

1900b—*Arcidens* Simpson, Proc. U. S. Nat. Mus., XXII, p. 661.

(Type *Alasmidonta confragosa* Say).

ANIMAL CHARACTERS.

Branchial opening densely set with papillae; anal finely serrated; supra-anal long with short mantle connection to anal; inner gills wider in front than outer, inner laminae of inner gills free; palpi large, united two-thirds of their length antero-dorsad; marsupium Anodontine both in external and internal structures; glochidium spined, large, hinge line undulate.

SHELL CHARACTERS.

Shell somewhat rhomboidal, inflated with rather high full beaks; disk and beaks profusely sculptured, the latter coarsely double-looped, the spinuous tuberculed loops extending in two diverging rows upon the disk; the former with oblique folds on the post-ventrad part with pustulated expansions along the post-umbonal ridge; cardinals present but only traces of laterals are seen; nacre white.

This genus is represented in this state by few individuals and while the only species of this genus, known so far, is both fluviatile and lacustrine it is more often found in quiet creeks, head waters of rivers or in other lacustrine conditions of the rivers, such as the pond-like stretches, sloughs, bayous, etc.

Arcidens confragosus (Say).

("Black Pocket-Book," "Black Pocket," "Rock Shell,"
"Rock Pocket-Book.")

Pl. XXII, Figs. 72 A and B.

1829—*Alasmodonta confragosus* Say, N. Harm. Dis., II, p. 339.

1888—*Margaritana confragosa* B. H. Wright, Check List.

1900b—*Arcidens confragosus* (Say) Simpson, Proc. U. S. Nat. Mus.
XXII, p. 662.

ANIMAL CHARACTERS.

NUTRITIVE STRUCTURES:—Branchial opening large, with few papillae; anal with tiny papillae on inner edge; supra-anal very long, connected antero-dorsad two-thirds of length; inner gills somewhat wider, inner laminae free from visceral mass; color of gills and palpi brown, all other soft parts soiled white and chamois like.

REPRODUCTIVE STRUCTURES:—Marsupium occupying only outer gills, light brown when sterile, spotted and vertically striated when gravid with early embryos, padiform and dark brown when gravid with ripe glochidia; internal structure of gravid marsupium typically Anodontine; glochidium of specimen from Platte River, Missouri, (0.355 x 0.350mm.) but possessing same shape, i. e., subtriangular, with undulate hinge line.

SHELL CHARACTERS.

EXTERNAL STRUCTURES:—Shell subrhomboid, inflated, roughly sculptured with apiculated tubercles in umbonal region, ribbed tubercles on post-umbonal ridge, coarse undulations across post-ventrad part of disk, slopes of post-dorsal ridge sub-costated; beaks full, high, corrugated; epidermis brown to black in adult, greenish mingled with black in youth.

INTERNAL STRUCTURES:—Cardinals single in right valve, double in left, the posterior one being long, serrated and placed just under the beak in place of the interdentum; laterals, faint in both valves; scars rather well impressed; umbonal cavity somewhat deep; nacre bluish to white with sky-blue border.

Sex	Length	Width	Diameter	Um. ra	Locality
♀ 103	x 67	x 48	mm	0.30	(Platte R., Mo.)
102	x 65	x 48	"	0.34	(L. Contrary, Mo.)
♂ 115	x 74.5	x 51.5	"	0.31	(Osage R., Mo.)
45	x 33	x 22.5	"	0.30	(" " ")

The latter measurement is that of a juvenile taken in a cutoff slough at Warsaw, Mo. Like that of other juveniles of this species, its supra-anal opening is found to be rudimentary—a mere furrow—and the gills are specked with minute black pigmented spots. Its shell is more rhomboidal than older; also two rows (five in a row) of ribbed tubercles; more prominent, coarse undulations not so distinct, nor horizontal; more zigzag sculpturing on disk; epidermis more blue-greenish; alae more costated; nacre more iridescent and bluish in beak cavities and with a brighter lavender ribbon around the margins.

MISCELLANEOUS REMARKS:—*Arc. confragosus* is peculiar in its shell structure by its profuse subspiny sculpturing on disk and beaks, its coarse tubercles—especially on umbonal ridge being smooth dorsad and ribbed ventrad and by its postero-cardinal of left valve being long, coarsely serrate and in place of interdentum. In many characters this shell is like that of of *Arkansia wheeleri* W. and O., but differs in not having well developed laterals and in having more profuse and prominent sculpturing. *Confragosus* is fond of quiet water and muddy bottoms; thus it is more lacustrine and when fluviatile it is found in creeks or in the head waters and bayous of the large streams. It has a general distribution from western Indiana to Iowa. Simpson reports it as most abundant in Illinois and is also generally found in the Mississippi and in the states adjoining, although it is, by no means, a common shell anywhere. It is a rare species even for North and Central Missouri where there are more lacustrine conditions and is not found at all in South Missouri. The author has found it gravid with active glochidia the latter part of January and with late embryos in the middle of March and great numbers were examined daily during July and August to find it sterile; thus it is bradytictic.

Genus, *Lastena* Rafinesque.

1820—*Lastena* Rafinesque, Ann. Gen. Sci. Phys. Brux., p. 316.

1853—*Leptodea* (Raf.) Conrad, Pr. Ac. N. Sci. Phila., p. 262.

ANIMAL CHARACTERS:—Branchial opening narrow, upcurved, papillose, anal smooth, supra-anal short, widely separated from anal; gills long, tapering posteriorly, outer and inner gills about the same size; inner laminae of inner gills free from visceral mass; palpi subfalcate; color of most exposed soft parts orange, rest of soft parts tan-colored and soiled white; marsupia, rusty color

when charged, ventral edges distended, water canals present. no specialized structure of mantle edge antero-ventrad to branchial opening; glochidium large, broadly spadiform, spined, hinge line straight.

SHELL CHARACTERS:—Shell thin, subalated, smooth on disk; beaks flat, sculptured with four or five rather double-looped ridges; epidermis smooth, polished, rayed in green in the region of the post-umbonal ridge; hinge teeth absent; scars faint, confluent; nacre bluish.

In this state this genus is represented by the two species, *Las. ohiensis* (Raf.) and *suborbiculata* (Say)—the latter not having been completely described hitherto. The author has had convenient access to large beds of *suborbiculata* and has been fortunate in securing specimens gravid with embryos in all stages and with mature glochidia. Neither has the latter been figured nor described before. Because of the fact that the marsupium of *suborbiculata* is more like that of *Arcidens* and that of *ohiensis* closer to *Anodonta* we would group the latter as more modern; then, too, the hermaphroditism and longer breeding season of *ohiensis* would also indicate an advance in being able to perpetuate the race.

***Lastena suborbiculata* (Say).**

("Suborb," "Heel-splitter.")

Pl. IV, Fig. 19a; Pl. IX, Fig. 19; Pl. XXIII, Figs. 73 A—D.

1831—*Anodonta suborbiculata* Say, New Harm. Diss. (Newspaper form); Am. Conch. I, No. II, 1831 (Later date), p. XI.

1867—*Anodon suborbiculatus* Sowerby, Conch. Icon., XVII, Pl. V, fig. 11, II.

ANIMAL CHARACTERS.

NUTRITIVE STRUCTURES:—Branchial opening comparatively small, upward curved with many fine orange colored papillae; anal also directed upward, smooth with Y-shaped yellow markings; supra-anal long, far removed from anal by mantle connections; inner gills wider but very little longer than outer, inner laminae of inner gills not connected to visceral mass; palpi rather long, united antero-dorsad about one-third of their length; pericardial region very large, watery, pinkish-brown in color; foot, long, thin, deep orange in color, adductors also orange, yellowish retractors and protractors visible through the watery, transparent

soft parts; gills olivaceous; patch in front of branchial opening light tan or chamois-like; cerebral ganglia bright orange spots external and on top of foot antero-ventrad to palps.

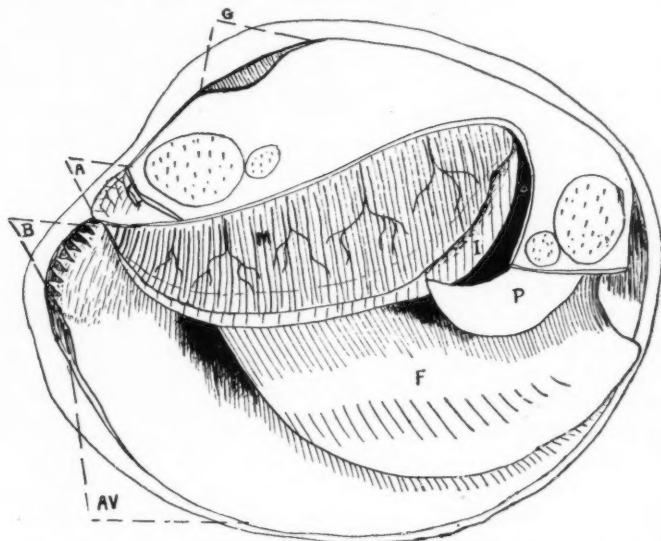


FIG. 6. *Lastena suborbiculata* (Say) ♀. Diagram of a gravid individual from Lake Contrary, St. Joseph, showing animal characters in left valve. ($\frac{3}{4}$ nat. size.)

REPRODUCTIVE STRUCTURES:—Marsupia when sterile, dark tan with crowded septa, tissue of ventral edge thickened, occupying outer gills only; when gravid, russet, with heavy septa more widely separated, distinct, veining enormously pad-like, greatly distended and faintly scalloped ventrad, longitudinal line, near and parallel to the ventral margin, indicating terminations of gill filaments; water canals next to thin laminae on either side of an undivided central ovisac which is closed at the base; no sexual specialization on margin of mantle antero-ventral to branchial opening (thickened edges here have nutritive function of siphonal contraction); glochidium spined, very large, broadly spadiform, hinge line straight, longer than high, (0.325×0.320 mm.) glochidial shell russet color, bluish spots for the adductors; no conglutinates

but glochidia are held together in loose masses by brownish mucus and coiled larval threads.

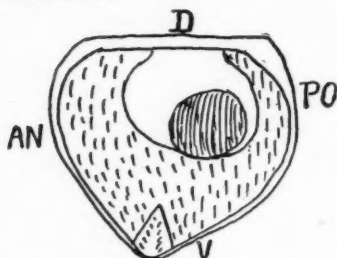


FIG. 7. Mature closed glochidium of *L. suborbiculata*. (x87.)

SHELL CHARACTERS.

EXTERNAL STRUCTURES:—Shell subround, or suborbicular, thin, compressed, rounded before, bowed ventrad, pointed behind, sulcated post-dorsad, alated, dorsal line from apex of wing to anterior end, straight and at an angle of 45 degrees; disk smooth; beaks flattened, sculptured with coarse wavy bars, intermediate ones bow-shaped and arched toward apex, latter double-apiculated with smaller tubercles just ventrad, later bars subundulate on upper disk and running more or less parallel with growth lines; epidermis polished, straw colored in young, light brown-horn in old; rayed all over with green capillary lines and one or two broad bluish-green bands from beak to extreme posterior point of shell; growth lines raised and undulated showing through on nacreous surface.

INTERNAL STRUCTURES:—Cardinals and laterals entirely lacking; anterior adductor muscle scars two comparatively deep elongated triangular areas, progressive impressions most distinct; other cicatrices very faint, confluent, mantle line broken by minute ridges; umbonal cavity shallow; nacre whitish, bluish or coppery, iridescent.

Sex	Length	Width	Diameter	Um. ra.	Locality
♀	185	x 130	x 67mm	0.290	(Lower L. Contrary, St. Joseph)
♂	150	x 117	x 49 "	0.270	(Upper L. Contrary, " ")
♀	47	x 35	x 14 "	0.260	(Sugar Lake, Armour, Mo.)
♂	34	x 23	x 9 "	0.250	(L. Contrary, St. Joseph, Mo.)

The latter measurement is that of the smallest juvenile of this species out of a collection of a little over a hundred of these delicate shells. This one was without byssi and doubt is expressed

as to whether any of the lacustrine *Anodontinae* are byssiferous, since the quiet water of the lake would perhaps make these threads unnecessary. The specimen above measured has a very thin, papery shell, almost transparent; ground-glass-like inside view, yellow-horn color outside appearance, beautifully rayed in green especially on post-umbonal slope. In life the heart beat could be detected through the thin shell and the alimentary tract traced; the heart beat 28 times per minute, regular but feeble, while that of an adult was only twenty-two times per minute, irregular but strong.

MISCELLANEOUS REMARKS:—This species is especially characteristic for the shape of its shell being not variable, but somewhat like an ordinary dinner plate as to form and size; also the very distinct progressive impressions are somewhat characteristic. Its shell is the largest in outline of any of the *Naiades*, although it is not heavy,—even with its soft parts. Its meat has been tested through Domestic Science to be of great food value. Except for greater inflation, in case of the female shell, no real sex dimorphism can be detected. The author has noted more of a greenish granular appearance for the outer gills of the male. The fact that the writer has discovered, from aquarium observations, *individuals discharging sperm on two occasions disproves that it is hermaphroditic*. For reference one of these males was killed and preserved in the act of discharging its sperm.

This discharge of sperm made the water milky and when examined by a high-power (X385) lens it was observed to be the flagellated sperm in cysts rolling about through the water like the colonial *Protozoa*. Then, too, the simple test that *not all individuals have the crowded septa of the outer gills* disproves that all have marsupial characters of these gills. Thus *hermaphroditism can not be applied to this genus Lastena, as a general character, if this species is to remain with it*. This is the *first description of the animal of this species that has been drawn up and the author has been the first to report its mature glochidium* which in general shape is about like that of *A. grandis* having about the same shape with the same straight hinge line, but being smaller. The glochidium is very active, having been observed to snap fifteen times per minute. The habitat of *suborbiculata* is that of black sand and mud bottoms in deep quiet water, is a rare shell in general distribution, but, when found, is abundant. Simpson reports it for Nebraska, Iowa,

Illinois, and Louisiana. Dr. W. S. Strobe reports it as very large typical and abundant in Illinois and the fact of its southern range to Louisiana (as reported by Mr. Frierson) is interesting. Although this mussel is very susceptible to the attacks of the parasite, *Atax*, its shell is hardly ever distorted for that reason; neither is the shell hardly ever eroded or injured by chemical reaction. An accurate breeding record, kept by the writer, shows it to be a long period breeder, but not so long or continuous as that of *Las. ohiensis* (= *imbecillis*.) It is found to be with early and late embryos from September to December, and mature and immature glochidia from December to March, but sterile for the remaining months.

***Lastena ohiensis* Rafinesque.**

("Paper Pond Shell.")

Pl. XXIII, Figs. 74 A and B.

1820—*Lastena ohiensis* Rafinesque, Ann. Gen. Sci. Brux., V, p. 316.

1829—*Anodonta imbecillis* Say, N. Narm. Diss. II, p. 355.

ANIMAL CHARACTERS.

NUTRITIVE STRUCTURES:—Branchial opening with yellowish tentacles pointed upward, anal narrow, smooth supra-anal small, far removed from anal; outer and inner gills about the same size, inner laminae free from visceral mass; palpi long, sickle-shaped, united antero-dorsad about two-thirds of its length; foot, adductors branchial opening region orange color, rest of soft parts tannish or dirty white.

REPRODUCTIVE STRUCTURES:—Marsupia rusty brown and pad-like with water-tubes and undivided ovisacs when gravid; mantle edge antero-ventrad smooth without sexual specialization; glochidium golden russet, broadly spadiform, spined, hinge line straight, longer than high (0.310 x 0.290mm.); no conglutinates; glochidia enmeshed in a tangle of larval threads.

SHELL CHARACTERS.

EXTERNAL STRUCTURES:—Shell subelliptical and subcylindrical, thin, inflated, slightly alated; disk smooth, shining; beaks flush with dorsal line sculptured with coarse looped bars, later ones being finely tuberculated, apex doubly apiculated; epidermis grass green, to olive with post umbonal slope marked by two or three bluish parallel rays.

INTERNAL STRUCTURES:—Teeth entirely lacking; muscle

scars faintly impressed, confluent; branchial cavities large; nacre pearl blue.

Sex	Length	Height	Diameter	Um.ra.	Locality
♀	98	x 40	x 39mm	x 0.320	(Mud Lake, Kenmoor, Mo.)
♂	63	x 34	x 31 "	x 0.340	(Lower Lake, St. Joseph, Mo.)
♀	61	x 28	x 35 "	x 0.360	(Spring Lake, Monegaw Spgs. Mo.)
♂	25	x 10	x 2 "	x 0.330	(Mud Lake, Halls, Mo.)

The latter juveniles of the last measurement has the least diameter that the author has ever examined. It was discovered in very active locomotion in shallow water along the lake beach and wonder was expressed how such a compressed shell could contain enough musculature for such vitality. Its beak sculpture presents two apiculations at the apex of the umbone surrounded by rather wavy or looped bars extending low to the disk. So thin were the valves and soft parts that when studied with the lens the heart action could be observed through the shell when held up to the light. The characteristic green rays, extending parallel along the post umbonal ridge area, are more pronounced here than in the adult shell.

MISCELLANEOUS REMARKS:—The vitality of *ohiensis* of the embryos in the active rotary motion is seldom seen in the *Naiades*. This motion was observed to take place around one axis from right to left in very rapid rotation. Mr. L. S. Frierson states that he has seen the glochidium taken from the mother and so sufficiently metamorphosed as to turn its shell up from a glass slide through an angle of 180 degrees.* The fact, too, of this species being normally *hermaphroditic* gives it a character possessed by few *Naiades*. The adult shell is also so peculiar that there is no need for confusion in making identification. The nearest to it in general form and color is *Lasmonos leptodon*, yet it can be easily distinguished from this distant relative by the beak sculpture and hinge. Its suppressed umbones flush with the dorsal line, making "beakless beaks," are perhaps its recognition marks. It is a lover of quiet, shallow water and muddy bottoms and for this reason is distinctly lacustrine. The author has found it in

* Dr. A. D. Howard has lately discovered *Lastena ohiensis* as also non-parasitic in its glochidial life and accounts for its distribution through the buoyancy of its juvenile shell as a compensatory provision for the loss of the usual means of distribution by fishes. (Science, N. S., XL, pp. 353-355, Sept. 4, 1914).

the main body of rivers but in such cases there was always some slough, bayou, or lake near by from which its light shell may have been carried over in time of flood. This species has a general distribution over the Mississippi and St. Lawrence basins. In this state it is confined to the lake district of N. W. Missouri, and in the lacustrine conditions of Central and South West Missouri. Its breeding season seems to be continuous for the year, or at least there is a very short interim of sterility. The author examined it nearly every month of the year to find it gravid and that, for the most part, with mature (active) glochidia. The "eye spots," mentioned by Simpson, as characteristic marks on the mantle edge at the branchial opening, have not been observed by the writer. Because of its Anodonta-like marsupia, but more on account of its physiological characters, in being a hermaphrodite with an almost continuous breeding season, this species should be assigned to a little higher position in the genus than *suborbiculata*. The fact that Rafinesque used *ohiensis* as the type for his genus *Lastena* and also because of such departure in anatomical and conchological features from those of the genus *Anodonta* for *ohiensis* and its nearest ally, *suborbiculata*, this genus *Lastena* should now be employed for these two species of this State.

Genus, *Anodonta* Lamarck.

1799—*Anodonta* Lamarck, Prodrôme Class. Coq., p. 87.

1817—*Anodontes* Cuvier, Regne. An., II, p. 472.

(Type, *Mytilus cygneus* Linnaeus).

ANIMAL CHARACTERS:—Branchial opening with yellowish papillae, anal smooth to slightly crenulated; supra-anal generally small, removed from anal by long mantle connection; inner lamina of inner gills free from one-half to entire length; palpi usually long and large; only outer gills marsupial, when marsupia are gravid, ventral edge distends and secondary water-tubes appear, ovisacs simple, undivided, dark brown when gravid with mature glochidia; no conglutinates formed; glochidia large, brownish, spined, spadiform.

SHELL CHARACTERS:—Shell elliptical, inflated, thin, slightly alated; disk smooth; beaks full high, sculpturing distinct, double-looped, angled upward centrally; epidermis polished, brightly colored; hinge teeth completely lacking.

No genus is so susceptible to so many mutations, yet it is

really only represented in this state by *A. grandis* and *Danielsii*. However, the latter, even may only be a creek form of *grandis*. A few other species, reported for this state under this genus, have doubtless received their names without deserving them and hence will only receive passing notice. The members of this group being lacustrine, they are limited more to the lake distinct in Northwest Missouri, to that portion of Central Missouri where lakes, ponds and sloughs abound, and to the Mississippi Lowlands of Southeast Missouri. Very few *Anodontae* are reported for South Missouri where lacustrine conditions are rare.

***Anodonta grandis* Say.**

("Floater.")

Pl. VII, Fig. 15; Pl. XXIII, Figs. 75 A and B.

1829—*Anodonta grandis* Say, N. Harm. Diss., II., p. 341.

1852—*Anodonta opaca* Lea, Rr. Am. Phil. Soc., X, p. 285, pl. XXV, fig. 46.

ANIMAL CHARACTERS.

NUTRITIVE STRUCTURES:—Branchial opening with rather long yellowish papillae; anal directed upward, smooth; supra-anal separated from anal by long mantle connection, small, almost closed in some instances; inner gills wider and longer, inner laminae entirely free from visceral moss; palpi very large united antero-dorsad about one-half of their length; anterior portion of pericardial region thick and watery; color of gills usually dark brown, mantle edge at siphonal openings blackish, palpi cream to purplish, remaining parts mostly tan or soiled white.

REPRODUCTIVE STRUCTURES:—Marsupium occupying outer gills only, when gravid pad-like, distended at ventral edge, secondary water canals present, undivided ovisacs in center, laminae very delicate rupturing at slight touch; sterile marsupia thickened at edges to allow for distention; *glochidium largest on record*, (0.400 x 0.395mm.), spadiform, spined, russet color, straight hinge line; no conglutinates, glochidia held in loose mosses by brownish mucus and tangles of crinkled larval threads.

SHELL CHARACTERS.

EXTERNAL STRUCTURES:—Shell subovate, large, greatly inflated especially in umbonal region, subalated, subsolid anteriorly,

rounded before, pointed behind; disk unsculptured; beaks full, apices recurved, sculptured by several coarse irregular double-looped ridges the loops being more or less nodulous; epidermis glossy, varied in color from brown-horn to green, growth lines rather undulated.

INTERNAL STRUCTURES:—Hinge teeth completely lacking; muscle scars not well impressed, progressive impressions most evident; umbonal cavities large and deep especially in female shell; nacre variable naturally from whitish, or bluish to coppery or even to salmon chocolate or brick-red, iridescent. Probably the latter colors are more pathologic than normal.

Sex	Length	Width	Diameter	Um. ra.	Locality
♀	215	x 118	x	84mm—0.360—	(Mud Lake, Kenmoor, Mo.)
♂	155	x 80	x 66	" —0.285—	(L. Contrary, St. Joseph, Mo.)
♀	105	x 63	x 50	" —0.380—	(" " " " " ")
♀	16	x 11	x 5	" —0.300—	(" " " " " ")

Several of these juvenile shells of *A. grandis* (the latter measurement being the smallest) were found in one spot on the west beach of Lake Contrary. These juvenile shells were identified by Dr. A. D. Howard of the U. S. Fisheries, Biological Station, Fairport, Iowa, where experimental rearing of these species from the glochidium has been made and a series of shells have been obtained all the way from its larval to its independent and mature life. At the end of the fifth year it is identical with that of Lea's *opaca*. The juvenile of the above measurement is very thin and papery almost transparent, is coarsely sculptured even on its disk—the bars being decidedly double-looped with a re-entering angle between the nodulous loops terminating at the tip of the umbone in two minute conical tubercles. It is especially to be noted that single laterals are faintly seen in each valve of this juvenile shell; also double right and single left cardinals may be seen with a (x12) lens.

MISCELLANEOUS REMARKS:—Perhaps no species of *Naiades* is so polymorphic as *A. grandis*. Probably these mutations are only zoogeographical expressions of its shell which seems to respond most readily to every change in ecological relations. Its pliable juvenile shell may be so shaped by its environment as to give rise to its many varietal forms. By choice *grandis* is lacustrine under which conditions its shell is typically inflated, shorter and thinner; if subjected even to the mild fluvial action of a creek

it becomes thicker and more compressed and more elongated. Its changes are so great at different ages that many names have given it for this reason; doubtless *A. opaca*, *stewartiana*, *leonensis*, etc., are mere synonyms for this reason. Because of parasitism, pounding of the surf, etc., this species is found in many pathologic forms in our lakes; a common one being that of a shell deeply sulcated at the post-ventral point and another with its shell extremely truncated post-dorsad. To the latter *A. footiana* and perhaps *A. dakotana*, may be referred. *A. salmonia* may also be assigned to a *grandis*-form that has a blistered salmon-colored nacre due to a distomid infection. *A. grandis* has a general distribution all over the Mississippi drainage, also in the St. Lawrence drainage and that of the Red River of the North. In this State it is found in most of its forms in the chain of lakes, "cutoffs," sloughs and bayous along the Missouri River and quiet, muddy creeks of the north and central portions. It has only been rarely reported for the Ozark Center or Plateau. The soft parts of the half-grown *grandis* (*A. opaca*) are found by Domestic Science tests to be very edible. A strict breeding record, kept by the author, shows this species to be gravid with glochidia from December until March and sterile from this month on to September; therefore it is a long period breeder and its larvae are the largest and most active known, contracting from ten to fifteen times per minute. The species which follow in description under this genus are only believed to be as mere forms of *grandis* and only receive separate notice because of their original report for this state, under these names,—and are so grouped for sake of conformity to other writers.

Anodonta dakotana Frierson.

("Dakota Shell," "Short Nose.")

Pl. XXIV, Figs. 77 A and B.

1914—*Anodonta dakota* Frierson MS.

ANIMAL CHARACTERS:—With the exception of shorter, wider gills, due to the shape of shell, the nutritive and reproductive structures of this species (if it be one) are identical with those of *A. grandis*. Its marsupium, in gravidity, is exactly the same; so are its glochidia in form and size (0.400 x 0.395mm.).

SHELL CHARACTERS:—Shell subrhomboidal, short, obese, abruptly truncated behind and, with the exception of not being

flat on the center of the disc, it may not be the typical *dakota* of Frierson. In other respects the shell structures are identical with those of *A. grandis*.

Sex	Length	Width	Diameter	Locality
♀	114	x	78 x 48	(L. Contrary, St. Joseph, Mo.)
♂	108	x	73 x 49 "	(L. " " " " ")

MISCELLANEOUS REMARKS:—This truncated form may only be the result of a local reaction on *grandis* as it is not often found in very quiet water but in the more disturbed water near the shore, yet its occurrence in such a constant shell-form is so common in our Missouri lakes that it would be safe to assign it to the definite species herein referred, or at least its subspecies. Dr. Ortman thinks this form may bear the same relation to our western lakes as *A. benedictis* (a form of *grandis-footiana*) does to Lake Erie where it is grown close to the shore in the surf.

Anodonta corpulenta Cooper.
("Big Floater," "Slop Bucket.")

Not figured.

1834—*Anodonta corpulenta* Cooper, App. to Narrative, Exp. Miss. R. to St. L., p. 154.—B. W. Wright Check List, 1888.

ANIMAL CHARACTERS:—The nutritive and reproductive structures are identical with those of *A. grandis*; however, its glochidium is different in shape and size, having an irregular, undulate, hinge line with length and depth equal (0.350 x 0.350mm.).

SHELL CHARACTERS:—With the exception of a shorter, wider, more inflated shell and also of more recurved beaks the shell is the same as that of *A. grandis*.

MISCELLANEOUS REMARKS:—Some students of *Naiades* are inclined to call *corpulenta* an "overgrown *grandis*." However, its smaller, but most of all, its differently formed glochidium would separate it from *grandis* since nothing is so constant as glochidial characters. This form is reported as rather common in the sloughs and lakes along the Mississippi in this state; yet it is not found in the lakes of North-west Missouri. Simpson reports it for the Missouri river (1900b, p. 646) but is not specific about the locality and states that it has a general distribution for the upper Mississippi River east to Indiana and south to Texas where it may be replaced by *A. stewartiana*. Dr. Surber (1913, p. 106, Pl. XXIX, fig. 1) has found this species to be an occasional fin-parasite upon

the same host as that for *Fusconaia ebena*. Its breeding season is the same as that of *A. grandis*.

Anodonta Danielsii Lea.

("Daniel's Shell.")

Pl. XXIV, Figs. 76 A and B.

1858—*Anodonta danielsii* Lea, Proc. Ac. N. Sci. Phila., III, p. 113;

Jl. Ac. N. Sci. Phila., 1860, IV, p. 365, Pl. LXIII, fig. 190.

1859—*Anodonta texasensis* Lea, Proc. Ac. N. Sci. Phila.; p. 113; Jl.

Ac. N. Sci. Phila. 1860, p. 366, Pl. LXIII, fig. 191.

ANIMAL CHARACTERS:—Branchial opening wide, densely papillose, anal smooth, supra-anal small, far removed from anal by mantle connection; palpi large, united two-third of their length antero-dorsad; inner laminae of inner gills free from visceral sac.

REPRODUCTIVE CHARACTERS:—Marsupia occupying outer gills, when charged pad-like, ventral edge blunt, greenish posteriorly, rest rusty brown; glochidia not found so far.

SHELL CHARACTERS.

EXTERNAL STRUCTURES:—Shell subelliptical, moderately large, subsolid; disk smooth; beaks rather low, sculptured with coarse double loops radiating from the beaks; epidermis dark horn with areas of green between the dark lines of growth.

INTERNAL STRUCTURES:—No teeth; scars faint; umbonal cavity shallow; nacre pearly-blue to light salmon with bluish border.

Sex	Length	Width	Diameter	Um.ra.	Locality
♀	115	x	55	x	40mm—0.304—(Lost Creek, Amity, Mo.)
♂	180	x	65	x	42 " —0.290—(Tarkio R., Craig, Mo.)
♀	82	x	42	x	30 " —0.268—(Flat Cr., Sedalia, Mo.)
♀	50	x	30	x	17 " —0.280—(" " " ")

The last measurement is that of the smallest and youngest *Danielsii* that has been obtained. It is a beautiful grass-green shell with a single brown band running parallel with the growth lines. Its beak sculpture is the most distinct of any in the writer's collection and is typically Anodontine. Its soft parts are tannish and the outer gills are plainly marsupial.

MISCELLANEOUS REMARKS:—This species is a rather common creek form of *grandis*. It is especially characterized by a more elongated, compressed and smaller shell. As a rule its shell is also thicker and its epidermis takes on more of a greenish color

with alternate brownish bands. It is striking to note such a close likeness of its shell to that of *Unio merus tetralasma* with which it often accompanied in our muddy, sluggish creeks of North Missouri. Of course it can be distinguished from the latter by its very different umbonal sculpturing and by the absence of teeth. Mr. Bryant Walker very kindly identified this species and stated that the shells were more compressed than those from Oklahoma and Kansas and that he had practically the same shells in his collection from South-west Missouri under the names of *Anodonta texasensis* Lea, but, being a doubtful species, it may equal to *Danielsii*, or at any rate the latter has priority. Hence, we are placing *A. texasensis* in the synonymy of this species. Simpson treats *texasensis* as very near *Danielsii* and, although he had only a young, broken shell from Lea's collection for study, yet he is very doubtful about the validity of it as a species and thinks it may only be a mere variety of *grandis* after all.

Anodonta Bealei Lea.

("Beale's Shell.")

Not figured.

1863—*Anodonta bealei* Lea, Pr. Ac. N. Sci. Phila., VII, p. 194; Jl. Ac. N. Sci. Phila., VI, 1866, p. 26, Pl. IX, fig. 25.

The writer, not having seen this species, would infer from Lea's figure that it is the same as *A. Danielsii*, or near. Through the kindness of Dr. Dall, curator of the Division of Mollusks for the U. S. National Museum, report was made that Dr. John H. Britts, (deceased), a well-known conchologist of this state, collected shells of *A. Bealei* from the Grand River, Henry County, Missouri and sent them to the National Museum where they are now deposited under the numbers, 150,392 and 150,391. Simpson states the geographic distribution of this species from Texas to Kansas.

Genus, Anodontoides Simpson.

1898a—*Anodontopsis* Simpson (in Baker), Tr. St. Louis Ac. Sci., VIII, p. 76.

1898b—*Anodontoides* Simpson (in Baker), Moll. Chicago, p. 72.

ANIMAL CHARACTERS.

"Animal with marsupium occupying the outer and sometimes the four leaves of the branchiae, ovules more numerous in the

outer, the whole pad-like; gills large, inner semi-circular, free from the abdominal sac or united with it; branchial opening large with many small, papillae; anal with well developed papillae." (Simpson).

SHELL CHARACTERS.

EXTERNAL STRUCTURES:—Shell sub-elliptical inflated, thin; disk smooth; beaks somewhat full with distinct beak sculpture consisting of concentric ridges upcurved behind; epidermis dark brown, polished, sometimes rayed; hinge-teeth lacking, or merest rudiments, scars shallow; nacre bluish white.

Dr. Ortmann considers this genus practically an *Anodon* with concentric beak sculpture and as a good connecting link for *Anodonta* and *Alasmidonta*. The only species of this genus, *ferussacianus*, is only represented along the Mississippi of this state where it is a rare shell. Unfortunately the soft parts, have not been secured for description. The glochidia of the species and sub-species (*subcylindricus*) of this genus have the same shape and measure 0.32 and 0.33mm. respectively—height and length being equal.

Anodontoides ferussacianus (Lea).

("Ferussac's Shell.")

Pl. III, Figs, 7a—8a.

1834—*Anodonta ferussaciana* Lea, Tr. Am. Phil. Soc. V, p. 45, pl. VI, fig. 15.

1898—*Anodontoides ferussacianus* (Lea) Baker, Moll. Chicago, Pt. I, p. 72, pl. III, fig. 6; V, fig. 2.

ANIMAL CHARACTERS.

According to Dr. Ortmann (1912b, p. 294) the anatomy of this species is essentially that of *Anodonta* and differs only in the shorter mantle connection between the anal and supra-anal and in the anal being distinctly papillose. The glochidia (Ortmann 1811b, pl. 89, fig. 12) are described as rather small (0.320 x 0.320 mm.) for the subfamily, subtriangular and spined.

SHELL CHARACTERS.

EXTERNAL STRUCTURES:—Shell subelliptical, thin, inflated, medium in size, post-umbonal ridge rather faint; compressed with distinct, regular, concentric ridges bent up behind and apiculated at the apices; epidermis brownish to bluish-green, some-

times rayed; hinge teeth rudimentary, usually lacking; muscle scars faint, confluent; nacre whitish or pearl blue.

Length	Width	Diameter	Um. ra.	Locality
48	x 29	x 18—0.280—	(Miss. R., Hannibal, Mo.)	
47	x 28	x 20—0.2850—	(Miss. R., Hannibal, Mo.)	

MISCELLANEOUS REMARKS:—Probably this species can be best characterized by its medium sized, sub-elliptical shell with its concentric, umbonal sculpturing, polished olive-green or brownish epidermis and slightly incurved hinge in front of beaks. *A. ferussacianus* is only known to occur for a certainty in the Mississippi of this state. Old, eroded shells from the Niangua River, Camden, Co., and from Casteel Creek, Clinton Co., have structures of this species more than anything else, but the identification is too doubtful for much consideration. The shell of this species is like that of *Strophitus*, but differs in beak sculpture; it also differs from some similar shells of *Anodonta* by the incurved anterior hinge to the beaks and by a compressed post-dorsal portion of shell back of a slight posterior ridge. Ortmann (1921b, pp. 293-294) denies that all four of its gills are marsupial, and Simpson, who claims to have found embryos in all four gills does not class this species under his *Tetragenae* (i. e., those that have all four gills marsupial) because its characters of shell and nutritive soft parts seem to agree better with his *Homogenae* (*Unios* with only outer gills marsupial.) This species is generally distributed throughout the Mississippi drainage, the St. Lawrence system and that of the Red River of the North. The subspecies only occur in the St. Lawrence drainage.

Genus *Alasmidonta* Say.

1818—*Alasmidonta* Say, Jl. Ac. N. Sci. Phila., I., p. 459.

1840—*Unio* Swainson, Tr. on Mal., p. 382.

ANIMAL CHARACTERS.

Mantle connection between anal and supra-anal openings moderately long; inner laminae of inner gills free from visceral mass, or, more or less connected to it; outer gills only marsupial; when charged, distended at ventral edges, water canals facing laminae present, central ovisacs undivided; no conglutinates, embryos held in mucus masses; glochidium large, spined, sub-triangular, hinge line straight, or nearly so.

SHELL CHARACTERS.

Shell subquadrate to subtrapezoidal, thin, inflated; disk smooth; beaks heavily sculptured with irregular concentric bars—the later ones being more or less undulate; epidermis olivaceous to burnt orange with broken rays; cardinals present, laterals reduced; beak and branchial cavities deep; nacre white to pearl blue.

The characters of the shell of this genus—especially in its coarse concentric beak-sculpture—shows that it is somewhat primitive, yet the tendency of the union of the inner laminae of the inner gills with the visceral mass in an indication of progress in structure. The two species that represent *Alasmidonta* for this State are not found in the interior north of the Missouri River.

Alasmidonta calceolus (Lea).

("Slipper Shell.")

Pl. XXIV, Figs. 79 A—D.

1830—*Unio calceola* Lea, Tr. Am. Phil. Soc., III, p. 265, pl. III. Fig. 1.

1898—*Alasmodonta deltoidea* Baker, Moll. Chicago, Pb. I., p. 63,

Pl. VI, fig. 2; VII, fig. 4.

1900b—*Alasmidonta calceola* (Lea) Simpson, U. S. Proc. Nat. Mus., XXII, p. 668.

ANIMAL CHARACTERS.

NUTRITIVE STRUCTURES:—Siphonal openings large, mantle edges with regular blocks of black; gills of medium size, inner laminae partly united with visceral mass; palpi rather long, tongue shaped; most of soft parts light yellowish.

REPRODUCTIVE STRUCTURES:—Marsupium pad-like and brownish when charged, water-canal present; glochidium large, spined, spadiform, longer than high, hinge line straight.

SHELL CHARACTERS.

EXTERNAL STRUCTURES:—Shell small, slipper-shaped or subtrapezoidal, obtusely angular behind, post-umboidal ridge rounded; disk smooth; beaks high, pointed, with coarse concentric sculpturing consisting of four or five bars sharply bent in behind; epidermis yellowish or olivaceous with wavy double rays on and parallel to the post umbonal ridge.

INTERNAL STRUCTURES:—Cardinals single and conical in right valve, double in left with post tooth saddle-shaped; laterals mere thickened hinge line; nacre white.

Sex	Length	Width	Diameter	Locality
♀	35	x 24	x 18 "	—(White R., Hollister, Mo.)
♂	26	x 18	x 10 "	—(Jack's Fork, Shannon Co.)
♀	18	x 11	x 7.5mm	—(Jack's Fork, Shannon Co.)

The latter is a juvenile, tawny in color, with beak sculpture extending well out upon the disk in undulated bars, showing here, as in so many of the *Anodontinae*, that in the adolescent shell there is more of tendency toward disk sculpture in the individual, just as seen in the primitive shell of the whole race of *Naiades*.

MISCELLANEOUS REMARKS:—This species is easily identified by its small shell (being never much more than an inch and one-half long), by its slipper-shape and by its coarse concentric sculpturing. It is a great burrower and, although it may be abundant, it may escape notice because of this habit. For this state *calceolus* is only found in the streams of the south slope of the Ozarks where it is found in company with its nearest relative *Alas. marginata*, and is found in greatest numbers in Jack's Fork of the Current River, Shannon County. It is found rather common in the streams of Arkansas, and has a general distribution in the Ohio, Tennessee and Cumberland Rivers; also the Lower and Middle St. Lawrence systems. Being found with mature glochidia in late Fall it can be classed as bradyctic.

Alasmidonta marginata Say.

("Nigger Toe," "Elk Toe.")

Pl. XXIV, Figs. 78 A and B.

1819—*Alasmidonta marginata* Say, Nich. Inc., No. 1.

1843—*Alasmidonta corrugata* DeKay, Zool. of N. Y., Pt. 5, p. 198, Pl. XXIV, fig. 259.

ANIMAL CHARACTERS.

NUTRITIVE STRUCTURES:—Branchial opening densely papillose; anal with fine papillae; supra-anal moderately separated from anal, mantle-edges marked with squarish black blocks at regular intervals; outer gills wider than inner; inner lamina of inner gills connected with visceral mass; palpi very long and united for one-half of their length antero-dorsad; foot very long and powerful, orange colored; other parts tannish colored.

REPRODUCTIVE CHARACTERS:—Marsupium with wavy crowded septa when sterile; greatly distended when gravid, bluish with

late embryos, brown with glochidia, ventral edge truncated, water canals on either side of undivided ovisacs; glochidia large, spined, spadiform, hinge line undulate, height greater than length (0.350 x 0.300mm.).

SHELL CHARACTERS.

EXTERIOR STRUCTURES:—Shell subrhomboidal, inflated—extremely so along the sharply angled, post-umbonal ridge; post dorsal ridge low with broad gentle slopes finely costated; disk smooth; beaks long full, sculptured with heavy concentric bars, the later ones undulated low almost to disk; epidermis smooth, polished, with spotted, greenish rays from anterior portion of shell to posterior ridge.

INTERIOR STRUCTURES:—Cardinals single in each valve, inter-dentum displaced by saddle-shaped tooth in left valve; laterals reduced to rounded edges; muscle cicatrices faint; shell cavity deep; nacre whitish to pearl blue and pinkish.

Sex	Length	Width	Diameter	Locality
♀	75	x 40	x 34 mm—	(Gasconade, R., Gascondy, Mo.)
♂	60	x 31	x 24 " —	(" " " " ")
♀	66	x 35	x 24 " —	(Jack's Fork, Shannon, Co. Mo.)
♀	37.5	x 21.5	x 11.5 " —	(" " " " ")

The juvenile of this last measurement presents the same sculpturing as in the juvenile *calceolus* except that the bars are somewhat more elongated in *marginata* and are really lower and coarser extending down well on the disk.

MISCELLANEOUS REMARKS:—It has been well known by Pilsbry and Fox that this western shell is not the *Alasmidonta truncata* Wright, mentioned by Simpson. This species is easily recognized by its post inflated shell making the post-dorsal portion almost truncated and also by its extremely coarse beak sculpture. Its very long narrow foot extension is a notable physiological character. It delights in sandy, pebbly situations. The muddy waters of North Missouri is not conducive to its distribution there and is very rare in the Osage basin; however, it is rather a common shell in the Gasconade where it reaches its greatest perfection and is commonly distributed throughout the mountain streams of the south. Occasionally *marginata* is found in the Mississippi north of the Missouri River. The author has records of its breeding season for August through to December, a sufficient record to know that it is a long period breeder (bradyctic.)

SPENCER FULERTON BAIRD

A BIOGRAPHY.

This biography deals with the life of a scientific collector, whose enthusiasm for his work was remarkable. The book contains many letters written by Mr. Baird himself, his brother William, who was also intensely interested in natural history, and by noted men of science who were contemporaries of theirs. The early letters of the two Bairds, while interesting to special students, do not possess the literary charm of more mature minds. Many of the letters of such famous authors as Audubon, Agassiz, Dana, and others are very readable and informing.

Besides these letters, the author, William Healey Dall, A. M. D. Sc., wisely introduced numerous notes by Lucy Hunter Baird, only daughter of the subject of the biography. Miss Baird had contemplated writing her father's life, for which she had gathered much material; but being an invalid, her strength was unequal to the task of composition, and her notes were all she accomplished toward the proposed biography. These notes, however, are the finest part of the life, and make the reader regret that the daughter was unable to do what her heart so desired.

The first four chapters of the biography are entitled respectively, 'Genealogical and Family Notes,' 'Childhood and Youth,' 'Life at Carlisle,' 'The Young Professor.' The first chapter gives a most interesting account of the ancestors of the Bairds, and of noted Americans who were their contemporaries. The three succeeding chapters inform the reader, through numerous letters, of the activities of Mr. Baird up to the time of his appointment as assistant secretary of the Smithsonian Institution. It must be said that hardly anyone but a scientific collector would be interested enough to read all of these letters. But the text of the author, and especially the notes of Lucy Hunter Baird, together with some of the letters, afford a clear insight into the beautiful character of Spencer F. Baird.

The two chapters, 'The Smithsonian Institution' and 'Life in Washington,' are very readable, being made up entirely of the observations of the author and of the notes of Miss Baird. The topics of these chapters are of general interest, dealing either with the growth and development of the Smithsonian or with important personages in Washington, with whom Mr. Baird had

official relations. Incidentally, his noble character is further revealed to the reader, who feels grateful for the opportunity of making the acquaintance of a man of such sterling worth.

The chapters, entitled respectively '1850 to 1865' and '1865 to 1878,' are filled with letters from eminent Americans who were either scientists or government officials. The contents of these letters being mostly of a scientific character, and even that of a special phase of the subject, they will not interest most readers enough to entice them to peruse the entire collection. The topics treated in these letters refer almost exclusively to collections that were being made for the Smithsonian Institution.

A very interesting chapter is that which follows the two mentioned in the last paragraph. Few letters find place in the text, and a more general interest is found in the varied activities of the new secretary of the Smithsonian Institution. Besides the immense work directly or indirectly connected with the Smithsonian, Baird's appointment as head of the U. S. Commission of Fish and Fisheries used up much of his energy from 1871, the year of the establishment of the Commission. Incidentally, much of what he planned and accomplished in this new department is narrated in this chapter.

Another interesting chapter tells the story of the foundation of the U. S. National Museum. Baird had long contemplated the project of a scientific museum that would be a credit to the greatness of the United States, and had for years accumulated material for this purpose. Finally the government gave the money that had been loaned and repaid by the corporation that managed the Centennial Exposition of 1876, toward the erection of a building in 1881, and G. Brown Goode, probably the greatest expert in the country on conducting museums, was put in charge of the new foundation.

The chapter on 'The U. S. Commission of Fish and Fisheries' contains much information of a general character that will be very welcome to any reader, whether he is specially interested in science or not. The nobility of Spencer Baird's soul is clearly evidenced in the disinterestedness with which he entered this new field of labor. He succeeded in getting congress to make his appointment non-remunerative, hoping that in so doing only worthy and competent men would ever be selected for the position of secretary. His success in promoting everything he undertook

in connection with fish and fisheries in the United States was well-nigh phenomenal. Like all the other chapters of this excellent biography, the present one gives us glimpses of a beautiful character, and our only regret in closing the volume is that there is so much in it on science, and not enough about a personality of such singular charm.

The biography fittingly ends with eulogies from public men, personal friends or acquaintances, and co-laborers of Spencer F. Baird. They all without exception speak in terms of great appreciation of the man, "the mere mention of whose name strikes a chord of dear memories in the hearts of all who knew him. No man of our time has left a purer memory, a more stainless name or a more animating and enduring influence over his special field of labor than S. F. Baird. He was loved by those who knew him when he was living; he is revered by those who have survived him. Mr. Baird lived on a higher plane of life and breathed a purer atmosphere than most men. Quiet and unassuming, with a nature as gentle as a child's, his natural superiority never failed to show itself when he was with other men."—*Brother Alphonsus, C. S. C.*

The biography is published by J. Lippincott Company, Philadelphia. Price, \$3.50.

NOTES ON OUR LOCAL PLANTS.—XIII.

BY J. A. NIEUWLAND.

Amelanchier intermedia Spach., Hist. Veg. 2: 85 (1834).

Amelauchier canadensis var. *oblongifolia* T. and G. Fl. M. A. 1:473 (1840).

Liverpool (Umbach), 964 St. Joseph. Common at Webster's north of Notre Dame, growing not far from both the preceding and following.

Amelanchier spicata (Lam.) C. Koch, Dendr. 1: 182 (1869).

Crataegus spicata Lam. Encyc. 1:84 (1783). *Amelanchier stolonifera* Wiegand, Rhodora 14:144 (1912).

Pine (Umbach), Lake Co. (Hill) S. E. of Notre Dame, also N. of Notre Dame at Websters.

ADENORACHIS (DC) Nwd., Am. Mid. Nat. IV., 93 (1915).¹

Aronia Medicus, Phil. Bot., 140 (1789) also Persoon, II., 39 (1807), not *Aronia* Mitchell, Diss. App. 1, (1769) = *Orontium* Linn. nor *Aronia* Athenaeus = *Arisarum* or some *Arum*: nor *Aronia* Dodonaeus and of the older writers (possibly *Crataegus* *Azarolus* Linn. or *C. Oxyacantha* Linn.) Dod., Cruydtboek, 522, 1176, 1255 (1618).

Adenorachis atropurpurea (Britton) Nwd. l. c.

Aronia atropurpurea Britton, Man. 517 (1901).

St. Joseph Co., Ind.

Adenorachis nigra (Medic.) Nwd.

Adenorachis melanocarpa (Michx.) Nwd. l. c. 94. *Aronia melanocarpa* (Michx.) Britton Ill. Fl. II, 291 (1913). *Mespilus arbutifolia* var. *melanocarpa* Michx., Fl. Bor. Am. I. 292 (1803). *Hahnia arbutifolia* var. β . *nigra* Medic. l. c. p. 82. (1793).

Marshall Co., Porter Co., Lake Co., (Deam).

OXYACANTHA Dioscorides, 1:105.

Crataegus Linn., Syst. (1735), Gen. 143 (1737), 213 (1754), *Mespilus* Tour., Elem. 502 (1694), *Mespilus* or *Crataegus* Tour., I. R. H. 632 or 642 (1700), *Oxyacantha* Lobelius, Caesalpinus, Ruppius, Dodonaeus, Dalechamps, J. Bauhin, Anguillara, *Crataegus* Theophrastus = *Pyrus torminalis*. According to some *Oxyacanthus* is *Berberis vulgaris* Linn. See Hermolaeus Barbarus, Cordus, Tabernaemontanus, Fraas, Bubani, etc.

Oxyacantha Crus galli (Linn.)

Crataegus Crus galli Linn. Sp. Pl., 476 (1753).

10523, 10400 Notre Dame, 520, 7573, Studebaker's Woods, South Bend.

¹ Medicus refers *Mespilus arbutifolia* Linn. (*Aronia arbutifolia* (Linn.) All. to his genus *Hahnia*. (Geschichte der Bot. 82 (1793). Medicus' genus is, however, an impossible aggregate of types containing beside the above, which is mentioned last, such widely different plants as *Pyrus torminalis* *Pyrus Aria*, *Mespilus Chamae-mespilus*, and *Sorbus fennical* Moreover, the genus is described by him as having, "Ein, zwei bis drei griffel. Die Frucht is ein zwei oder dreifacherichte oben geschlossene fleischhohle etc. Under the caption *Hahnia arbutifolia* he seems to apologize for including this plant in *Hahnia* "Hat gewöhnlich fünf, griffel und fünf lederartige Gefache, in jeden einen bis zwei Saamen." *Aronia arbutifolia* (Linn.) Ell. can in no way be considered as even properly belonging in *Hahnia*, to say nothing of being regarded as its type. Any one then who would so far abuse the application of the theory of residues as to use this name too replace *Aronia* were foolhardy indeed.

Oxyacantha calpodendron (Ehrh.).

Crataegus calpodendron Medic., Gesch. Bot. 83 (1793) *Mes-pilus calpodendron* Ehrh. Beitr. 2: 67 (1788), *Crataegus tomentosa* Du Roi, Harbk. Baumz. ed. I, 183 (1771) not Linn.

Lake Maxinkuckee (Clarke), Elkhart (Barnes), 2162 Lake Co. 10386 Notre Dame 578½ Laporte Co.

Oxyacantha alnorum (Sarg.).

Crataegus alnorum Sarg. Rhodora, 5:153 (1903).

2003, 13088 Notre Dame, Ind.

Oxyacantha macrosperma (Ashe).

Crataegus macrosperma Ashe, Jr. E. Mitch. Soc., 16: 73 (1900). Porter Co. (Dea).

Oxyacantha rugosa (Ashe).

Crataegus rugosa Ashe, Jr. E. Mitch. Soc. 17: 19 (1902).

461, St. Joseph, Mich.

Oxyacantha Jesupi (Sarg.).

Crataegus Jesupi Sarg. Rhodora 5:61 (1903).

1663, 2161, 10313, 10417, 11155, 10383, 10384, 10530 Notre Dame, Ind., 10312 Studebaker's Woods, South Bend, Ind.

Oxyacantha punctata (Jacq.).

Crataegus punctata, Hort. Vind., 1: 10, pl. 28 (1790).

1678 Notre Dame, Ind., 514, 9146, 10313 Studebaker's Woods, South Bend.

Oxyacantha coccinoides (Ashe).

Crataegus coccinoides Ashe, Jr. E. Mitch. Soc. 16: 74 (1900).

10385, 13103 Notre Dame, Ind.

Oxyacantha coccinea (Linn.).

Crataegus coccinea Linn., Sp. Pl. 476 (1753).

435, 436, 1706, 1818, 2003½, 10338 Notre Dame, Ind., Lake Maxinkuckee (Clarke), St. Joseph (Rothert).

Oxyacantha Brainerdi (Sarg.).

Crataegus Brainerdi Sarg. Rhodora 3: 27 (1901).

2143, 9536, 10376 Notre Dame, Ind.

Family 92. **DRUPACEAE** Linn., Phil. Bot. 31 (1751) and (1754).

Amygdalaceae Reichb. Consp. 177 (1828), Don. Gen. II, 481 (1832), Roemer, Syn. Mon. III, 1, (1847). *Amydaleae* Juss. Gen., 340 (1789).

PRUNUS Dioscorides, Mat. Med., 137.

Proune Theophr. 4:3, Tour., Elem. 494 (1693). I. R. H.,

632 (1700), Linn., Syst. (1735) *stricto sensu*, Gen. 141, (1737), 213 (1755) in part. *Prunus* of all the older authors.

Prunus americana Marsh, Arb. Am. 111 (1785).

Starke Co. (Deam. 11086 Notre Dame, Ind.

CERASUS Theoph., Hist. 3: 13.

Cerasus of nearly all the older writers. Tour., Elem. 625 (1694) I. R. H., 496 (1700) Linn., Syst. (1735). *Prunus* in part of his later works. Except Gen 141 (1737).

Cerasus pennsylvanica (Linn. f) Loisel. Arb., 9 (1801-1819).

Prunus pennsylvanica Linn. f. Suppl., 252 (1781).

Clarke, Ind. (Umbach) Porter Co. Deam, 9122 Lakeville, Ind. (Greene).

Cerasus acida Brunfels, Herb. Viv. Ic. (1531-2).

Cerasus sativa Tragus, Hist. 1026 (1552), *Cerasus vulgaris* Tragus, *C. austera* Cordus Hist. Annot. 23 (1561), *Cerasus macedonica* Pliny?

10515 St. Joseph, Mich. (Escaped.)

Cerasus glauca Moench, Meth. 672 (1794).

Cerasus pumila Michx., Fl. Bor. Am. II., 286. (1803) not *C. pumila* Botck. (1797). = *C. Chamaecerasus*.

18045 Porter Co. (eDam.) Lake Co. (Deam) (Coulter), Porter Co. (Cowles) Pine and Clarke, Ind. (Umbach). 2629 Millers, Ind., 467, 447, 3339, 3359, St. Joseph, Mich. 712 Saganay, Laporte Co., 11754. Webster's Crossing, St. Joseph Co. This plant is mostly shrubby, 6 feet tall and upright. Common in the dune region of Lake Michigan.

PADUS Theophrastus, Hist., 4: 1.

Also *Padus Cusa*, C. Bauhin etc. *Padus* Linn. Syst. (1735). Gen. 142 (1737), Miller, Gard. Diet. Abr. ed. 4, (1754).

Padus nana (Du Roi) Roemer, Arch. 1, 2: 38 (1797).

Prunus nana Du Roi, Harbk. Baumz., 1, 2: 194 (1772).

Prunus virginiana of Am. authors not Linn.

Lake Co. (Deam) Porter, Laporte, (Deam), Lake Maxinkuckee (H. W. Clarke), 3736) Notre Dame (Powers), 2015, 10512 Notre Dame.

Padus virginiana (Linn.) Miller. Gard. Diet. ed. 8. No. 3 (1768).

Prunus virginiana Linn. Sp. Pl. 473 (1753), *Prunus serotina* Ehrh. Beitr. 3: 20 (1788).

Marshall, Porter Co. (Deam). Lake Maxinkuckee (H. W.

Clarke), Clarke, Ind. (Umbach), 9265, 10516 Notre Dame, 7755 St. Joseph, Mich.

PERSICA (Pliny, Theophr.) Tabernaemontanus, Auguillara Lacuna, Gerard, Camerarius, Tragus, Fuchs, Hist, 205a (1549). *Persicus* Palladius, *Persicum* T. Gaza. 1529 *Malum persicum* Pliny, 13: 19. *Persica* Tour. Elem. 496 (1694), I. R. H., 624 (1700). *Persica* Duham. Arb., II, 105. (1755).

(T be continued.)

UNIONIDAE WITH ABNORMAL TEETH.

BY SAM. W. GEISER.

The following brief list, notes, and partial bibliography, is given as a contribution to the scanty literature dealing with this phase of molluscan life and teratology.

In the years 1908-1911, the writer collected a considerable amount of molluscan study-material, from the various rivers of the northeastern part of the state of Iowa, particularly in Buchanan, Fayette, Clayton, Allamakee, and Winneshiek Counties. In the summer of 1913, the waters of a number of other rivers in Iowa were examined.

It is surprising to find how large a percentage, *relatively*, of the mollusks of this group are either abnormal, or in some way diseased, *in certain restricted localities*, while one may go over, carefully, a large number of shells from other stations, without finding any teratologic specimens. All but one of the specimens noted came from the Wapsipinicon river near Independence, Iowa. Briefly listed, they are:

SHELL WITH ONE PSEUDOLATERAL IN EACH VALVE:

Lampsilis luteola, ♂, 4 years old, ♀, 5 years old.

Lampsilis ventricosa, ♀, 6 years; w. 3 pseudocardinals in right valve, sex? 2 yrs.¹

LATERALS OF BOTH VALVES FLATTENED:

Lampsilis ventricosa, ♂, 12-15 yrs. (Cardinals gone by dental caries.)

NO PSEUDOCARDINALS IN RIGHT VALVE:

Lampsilis luteola, ♂, 6 yrs.

¹ See in this connection THIS JOURNAL, Vol. II, pp. 65-67, 1911.

THREE PSEUDOCARDINALS IN RIGHT VALVE:

Lampsilis ventricosa, ♀, 6 yrs., (1 lateral in left valve); ♀ 10-12 yrs.

Lampsilis luteola ♂, 6 yrs.

A study of the frequency of occurrence of diseased and abnormal freshwater mussels seems to indicate:

That certain weak-toothed genera, like *Symphynota* and *Alasmodonta* have very rarely abnormalities of any kind.

That, in the order of frequency of occurrence, the Anodontoid genera and *Lampsilis ventricosa* and *Lampsilis luteola*, are commonly affected by trematode parasites, which disfigure the shells internally.

That the presence of garbage, especially sewage, in the water apparently conduces to the well-being of these parasites, while anodontoid shells from clear ponds are in very many cases entirely free, as a community, from these parasites.

In certain of the most common and widely distributed genera and species, especially *L. luteola* and *L. ventricosa*, the teeth are often defective through what has been called "dental caries," in which the horny material of the ligament and periostracum has replaced the shelly substance of the hingearea.

Quadrula, *Pleurobema*, and similar genera with heavy shell and teeth, are, as a rule, generally normal.

AN ANNOTATED PARTIAL BIBLIOGRAPHY, ARRANGED CHRONOLOGICALLY, OF PAPERS ON THE SUBJECT.

LEA, ISAAC. *Description of a New Genus of Naiades*. Tr. Am. Phil. Soc., 1829, III: 403-457, 8 plates. [1830]. At page 428, pl. viii, fig. 11, is described *Unio heterodon* (= *Alasmodonta heterodon* (Lea) Simpson,) from the Schuylkill. The species is very variable, as the laterals in each valve may be single, double or triple.

CONRAD, TIMOTHY A. *Descriptions of New Fresh-Water and Marine Shells*. Jl. Acad. Nat. Sci. Phila., 1850, pp. 275-278, 2 plates. At p. 276, pl. xxxvii, fig. 7, may be found description of *Unio contrarius* (= *Lampsilis contraria* (Conr.) Simpson). The locality, (Ogeechee River, Georgia,) Simpson considers doubtful, and opines that this species may be simply a small male specimen with reversed laterals.

AGASSIZ, LOUIS [Communication on Abnormal Shells] Proc.

Boston Soc. Nat. Hist. VII: 166-167, [1859]. He exhibited a reversed *L. ligamentina*.

LEA, ISAAC. [Communication on Reversed Unios]. Proc. Acad. Nat. Sci. Phila., 1860, pp. 51-53. A very interesting paper—worth attention. A list is given of the teratologic specimens in Dr. Lea's cabinet.

KEYES, CHARLES R. *An Annotated Catalogue of the Mollusca of Iowa*. Bull. Essex Inst., XX: 61-83, (1889). Notes the collection of a number of specimens, but gives no records.

SIMPSON, CHARLES T. *The Classification and the Geographical Distribution of the Pearly Fresh-Water Mussels*. Proc. U. S. Nat. Mus., XVIII: 295-843, w. pl. ix. Observations on margaritanoid genera, (p. 303), *Margaritana monodonta*, (p. 304), *Dallia purpurea*, (pp. 304-305), and *Symphynota compressa*, as well as others, are interesting, in this paper. SIMPSON's *Synopsis of the Naiades, or Pearly Fresh-Water Mussels*, (Proc. U. S. Nat. Mus., XXII: 501-1044, (1900)), contains also many scattered notes on dental variation.

A paper by the present writer, already referred to in footnote. [1911].

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RECORDS OF ADVENTIVE PLANTS.

Among the plants which as far as I have been able to find have not as yet been recorded from our region the following may be of interest. *Conringia orientalis* (Linn.) Dumort., was found along the Michigan Central R. R. at Notre Dame. Quite a number of plants were seen so that it may be considered as part of our flora. Rather more important would appear to be the presence of *Grindelia squarrosa* (Pursh) Dunal. It was found in an alfalfa patch about one mile from Hudson Lake in Laporte County. A considerable number of plants were apparently well established. The most eastern record according to the manuals is Illinois, but it seems to be working its way eastward, being probably introduced with alfalfa seed. *Matricaria matricarioides* (Less.) Porter (*Matricaria discoidea* DC.) has been established at Notre Dame for many years along walks and on the campus where it reappears annually. It is native of the Pacific coast.—J. A. N.

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